ORCA GATEWAY
HARDWARE MANUAL

NUERA™

299-335-104

ORCA Gateway Hardware Manual

Nuera Communications, Inc.

September, 2003

Fourth Edition (September, 2003)

This edition applies to the Nuera Communications, Inc. ORCA RDT-8v release 7.2, ORCA GX release 8.0 , ORCA RDT-8g release 7.0, and ORCA BTX-Series release 2.0 gateways. The licensed product described in this document and all licensed materials that are available for it are provided by Nuera under terms of the agreement for Nuera licensed products. Nuera periodically makes additions, deletions, or changes to the information in this document. Before you use this document, consult Nuera or your distributor for the most recent Nuera edition.

The author and publisher have made reasonable efforts to ensure the accuracy and timeliness of the information in this book. However, neither the author nor the publisher shall have any liability with respect to loss or damage caused or alleged to be caused by reliance on any information in this book.

Nuera may have patents or pending patent applications covering material in this document. Furnishing this document does not of itself constitute a grant of any license or immunity under any patents, patent applications, trademarks, copyrights, or other rights of Nuera, or of any third party, or any right to refer to Nuera in any advertising or other marketing activities. Nuera assumes no responsibility for any infringement of patents or other rights of third parties that may result from use of the material in this document or for the manufacture, use, lease, or sale of machines or software programs described herein, outside of any responsibilities assumed in the original or subsequent purchase or lease agreements.

This document may contain information about, or make reference to, Nuera products, programming, or services that are not available in your country. This information must not be construed to mean that Nuera intends to make available such products, programs, or services in your country.

A form for your comments is provided at the back of this document. If the form has been removed, address your comments to: Nuera Communications, Inc., Information Development Group, 10445 Pacific Center Court, San Diego, CA 92121.

Nuera may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

No part of this publication may be reproduced in any manner without the written permission of Nuera, Inc. For information, write to: Nuera Communications, Inc., Legal Office, 10445 Pacific Center Court, CA 92121.

© 2001, 2003 by Nuera Communications, Inc.

Important Notices

Warnings!

See the “Regulatory Information” appendix in this book for specific regulations for various localities.

These are Class A products. In a domestic environment, these products may cause radio interference, in which case the user may be required to take adequate measures. The domestic environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10 meters of the apparatus concerned.

Nuera Communications, Inc.
10445 Pacific Center Court, San Diego, CA 92121 (858) 625-2400; FAX (858) 625-2422

ORCA User Library

All books that support the ORCA product line are provided on a compact disc (CD) in Adobe Acrobat format. Included on the CD is the appropriate version of Adobe Acrobat Reader.

This section lists the titles of all the books in the ORCA library. To order any of these books, contact your distributor or Nuera directly. To make comments or suggestions regarding any of these books, direct your correspondence to **tac@nuera.com**.

Number	Book
299-225-4*nn*	***ORCA SSC Softswitch User's Guide***
	This book presents conceptual information about the use and functionality of the ORCA SSC Softswitch. It also provides information about installing and configuring SSC for use with other equipment.
299-193-5*nn*	***ORCA GX-Series Software Manual***
	This book is designed for the system integrator/system administrator who needs to configure ORCA GX gateways at an end-user site. Its purpose is to guide this individual through the configuration steps required to get the ORCA GX gateway correctly configured using network management software.
299-297-5*nn*	***ORCA RDT-8g Software Manual***
	This book is designed for the system integrator/system administrator who needs to configure ORCA RDT8g gateways at an end-user site. Its purpose is to guide this individual through the configuration steps required to get the ORCA RDT8g gateway correctly configured using network management software.
299-298-5*nn*	***ORCA RDT-8v Software Manual***
	This book is designed for the system integrator/system administrator who needs to configure ORCA RDT8v gateways at an end-user site. Its purpose is to guide this individual through the configuration steps required to get the ORCA RDT8v gateway correctly configured using network management software.
299-252-5*nn*	***ORCA BTX-Series Software Manual***
	This book is designed for the system integrator/system administrator who needs to configure ORCA BTX gateways at an end-user site. Its purpose is to guide this individual through the configuration steps required to get the ORCA BTX gateway correctly configured using network management software.
299-335-1*nn*	***ORCA Gateway Hardware Manual***
	This book presents conceptual information about the use, functionality, and specifications of the ORCA gateways, including installation steps and information.

Additional ORCA books are available in hard copy form from Nuera. For information regarding pricing and availability, contact a sales representative at:

Nuera Communications, Inc.
10445 Pacific Center Court
San Diego, CA 92121
858-625-2400

Trademarks Used in This Manual

The following list contains trademarks that are used in this manual. In the United States, these trademarks are registered trademarks; in World Trade countries, these trademarks are not registered.

Trademark	Trademark Owner
Access Plus F50/F50ip/F100/ F120/F200/F200D/F200ip	Nuera Communications, Inc.
Amphenol	Amphenol, Inc.
ANSI	American National Standards Institute
Cisco	Cisco Systems, Inc.
CS-ACELP	Lucent, SiproLab, and NTT
E-CELP	Nuera Communications, Inc.
IBM	International Business Machines, Inc.
Microsoft	Microsoft Corporation, Inc.
OpenView	Hewlett-Packard Company
ORCA	Nuera Communications, Inc.
Teflon	E. I. duPont de Nemours and Company
UNIX	The Open Group
VT100	Compaq Digital Equipment Corporation

Trademark	Trademark Owner
Windows /NT/2000/XP	Microsoft Corporation, Inc.
Procomm Plus	Symantec Corporation

TABLE OF CONTENTS

About This Book xvii
Who Should Use This Book xvii
How To Use This Book xvii
Conventions Used in This Book xviii
How Numbers Are Used xviii
Replaceable Input Values xix
Textual Callouts xx
Getting Help xxi
Checklist xxi
Last Resort xxii
Contacts xxii

Chapter 1. Overview 23
ORCA GX-Series Release 8.0 Overview 23
Design 23
Networking 25
ORCA RDT-8g Overview 29
ORCA Design 29
Feature Summary 31
ORCA RDT-8v Overview 32
ORCA Design 33
Feature Summary 35
ORCA BTX-Series Overview 36
ORCA Design 37
Feature Summary 38

Chapter 2. Chassis and Components 41
Chassis Overview 41
Dimensions 41
Intercard Signals 42
PCI Standards 42
Power Supplies 43
Fan Modules 43
21-Slot Base Unit 44
8-Slot Base Unit 48

Chapter 3. ORCA Gateway Card Modules 51
Front Cards 51
CM Module 52
CM3 Module 52
HST Module 52
HUB2 Module 53
UPM3 Module 53
UPM4 Module 53

Transition (Back) Cards 55
CMX Module 55
HSTX Module 57
HSTX Bridge Module 58
HUB2X Modules 59
Load Transition Module 61
UPMX Module 62
Module Redundancy 63
Control Clusters 63
HST Clusters 64

Chapter 4. Installing the ORCA 21-Slot Chassis 65
Installation Preparation 65
Site Environment Guidelines 66
Necessary Tools 67
Safety Precautions 68
Installing the Chassis 69
Power Module Installation 71
Connecting Main Power 74
Grounding the ORCA 21-Slot Chassis 75
Connecting DC Power 75
Connecting AC Power 78
Power Cable Requirements 78
Applying Power 82
Power-On Self-Test 82
Signal Cables 83
Connecting the HSTX Bridge Card Cables 83

Chapter 5. Installing the ORCA 8-Slot Chassis 85
Before You Start 85
Tools 85
Unpacking the 8-Slot Chassis 86
Opening the Carton 87
Installing the ORCA Chassis 87
Connecting Main Power 89
Signal Cables 98

Chapter 6. Configuration 99
The Console Port 99
Console Port Commands 100
SNMP Community String Commands 101
SNMP Configuration Commands 102
Packet Sniffing Debug Commands 104
Ethernet Commands 105
Help Command 107
Route Command 107
Syslog Command 108
Password Command 109
Traceroute Command 109
Ping Command 109

Quit Command 110
Shelf ID Show Command 110
Storage Initialization Command 110
Version Command. 111
Nuera Configurator and NueraView 111

Chapter 7. ORCA Gateway Maintenance 113
Power Precautions 113
Gateway Status. 115
Card LED Indicators 115
Power Module LED Indicators 116
Fan Module LED Indicators. 116
Power Module Maintenance. 116
21-Slot Chassis Power Modules 116
8-Slot Chassis Power Modules 121
Fan Module Maintenance. 121
21-Slot Chassis Ventilation 121
8-Slot Chassis Ventilation 123
Card Maintenance 125
Installing Cards 125
Removing Cards 131
Swapping CM Cards Between Gateways 133
Hot-Swapping Cards. 135
Upgrading an ORCA Gateway. 137
Upgrading the Embedded Code 137
Upgrading Card Modules 138

Chapter 8. Troubleshooting 139
System LEDs. 139
Card Modules 139
ORCA Power Modules 142
ORCA Fan Modules 143
System Alarms 143
Getting Help 143
Checklist 143
Last Resort 144
Contacts. 144

Appendix A. Specifications. 147
21-slot Chassis Specifications 147
8-slot Chassis Specifications 153

Appendix B. Replacement Parts 159
Replacement Assemblies 160
Power Cables. 161
Documentation 161
ORCA Connecting Cables. 161
DS3/HST Redundancy Kit 162
CMX Card Console Port Cables 162

Appendix C. Cables and Connectors 165
CMX Ports 166
Console Port 166
Alarm Port 171
HUB2X Ports 174
RJ-45 Ethernet Port 174
Optical Ethernet Port 177
HSTX Ports 179
BNC Port 179
UPMX Ports 181
Telco Port 182

Appendix D. Regulatory Information 189
United States FCC Notice 189
Industry Canada Notice 190
Bibliography 195
Hardware Specifications 195
Network Management Publications 198
Hewlett Packard Publications 198
Warranty 201
Reader's Comment Form 203

List of Figures

Figure 1. ORCA Gateway Connections 27
Figure 2. ORCA SSC 28
Figure 3. ORCA Gateway 21-Slot chassis, Front View (Cover Removed) 45
Figure 4. ORCA Gateway 21-Slot chassis, Back View 47
Figure 5. ORCA Gateway 8-Slot chassis, Front View (Cover Removed) 49
Figure 6. ORCA Gateway 8-Slot chassis, Back View 50
Figure 7. CMX Ports 56
Figure 8. HSTX Module Ports 58
Figure 9. HSTX Bridge Module Ports 59
Figure 10. HUB2X-1000Base-SX Ports 60
Figure 11. HUB2X-100Base-T Ports 61
Figure 12. UPMX Card Ports and Connectors 62
Figure 13. ORCA 21-Slot Chassis 70
Figure 14. ORCA Gateway Power Module 72
Figure 15. Power Module Installation 73
Figure 16. Power Module Locking Handle 73
Figure 17. ORCA 21-Slot Chassis Ground Terminal Posts 75
Figure 18. ORCA 21-Slot Gateway DC Power Terminal Posts 76
Figure 19. ORCA DC Power Cabling 77
Figure 20. Fastening Cable Clamps 77
Figure 21. AC Terminal Block 79
Figure 22. AC Screw Terminals 80
Figure 23. Attaching Terminal Lugs 81
Figure 24. Applying Power 82
Figure 25. The Bridge Card Connected to the Protected (standby) and Working (active) HSTX Modules 84
Figure 26. ORCA 8-Slot Gateway Shipping Carton and Contents 87
Figure 27. ORCA 8-Slot Chassis 88
Figure 28. 8-Slot Ground Terminal Posts 90
Figure 29. DC Power Connectors 92
Figure 30. Connecting DC Power 93
Figure 31. AC Power Connections 95
Figure 32. Connecting AC Power 96
Figure 33. Applying Power 97
Figure 34. Help Command Display 107
Figure 35. ORCA Power Module 117
Figure 36. Servicing the Power Supply Air Filter 119
Figure 37. 8-Slot Chassis Filter Maintenance 120
Figure 38. ORCA Fan Module 122
Figure 39. Fan Tray Replacement, 8-Slot Chassis 123
Figure 40. Ejector Tabs in Unlocked Position 126
Figure 41. Aligning Card in Guide Slot 127
Figure 42. Card Slots (Showing ESD Clips) 128
Figure 43. Aligning Guide Pins 129

Figure 44. Ejector Tabs in Locked Position 130
Figure 45. Locating Upper and Lower Captive Screws (Lower Shown) 132
Figure 46. Removing Card 133
Figure 47. CMX Card Ports 166
Figure 48. CMX Console Port Connector Pin Assignments 167
Figure 49. CMX Console Port Connector Pin Assignments 167
Figure 50. DB9 (F) DTE-to-DB25 (F or M) DTE, RS232 (500-074/075) 169
Figure 51. DB9 (F) DTE-to-DB25 (F or M) DCE, RS232 (500-078/079) 169
Figure 52. DB9 (F) DTE-to-DB9 (F) DTE, RS232, Null Modem (500-252) 170
Figure 53. DB9 (F) DTE-to-DB25 (M) DCE, RS232 to RS485 (501-350). 170
Figure 54. CMX Console Alarm Port Connector. 171
Figure 55. CMX Alarm Port Connector Pin Assignments 172
Figure 56. DB15 (M)-to-DB15 (M), CMX Alarm Cable (504-149) 173
Figure 57. HUB2X-100Base-T Card Ports 174
Figure 58. HUB2X-100Base-T Card RJ-45 Connector and Pin Assignments 175
Figure 59. 100Base-T Standard, Straight RJ45 (504-172). 176
Figure 60. HUB2X1000Base-SX Card Ports. 177
Figure 61. HUB2X Card Optical Connector 178
Figure 62. HSTX Card Ports 179
Figure 63. HSTX DS3 BNC Port Connector 180
Figure 64. DS3 BNC 75-ohm Cable (504-264) 181
Figure 65. UPMX Card Ports and Connectors 181
Figure 66. UPMX Card DB25 Connector 182
Figure 67. UPMX Card DB25 T1 Interface Pin Assignments 183
Figure 68. ORCA DB25 (F)-to-RJ45 (M) (4x) (504-121) 185
Figure 69. ORCA DB-25 (F) Telco Straight-to-Open (504-124) 186
Figure 70. ORCA DB25 (F)-to-ORCA DB25 (F) (504-146) 187
Figure 71. ORCA DB25 (F) to RJ45 Adaptor (504-087) 188

LIST OF TABLES

Table 1. Front Card Usage Matrix 51
Table 2. Back Card Usage Matrix 55
Table 3. Power Cable Color Codes 79
Table 4. AC Power Cable Options 94
Table 5. LEDs: All Cards 140
Table 6. LEDs: Error Indicators 141
Table 7. LEDs: Power Modules 142
Table 8. LEDs: Fan Modules 143
Table 9. 21-Slot Chassis Supported Voice Compression Algorithms 148
Table 10. 8-Slot Chassis Supported Voice Compression Algorithms. 154
Table 11. Replacement Assemblies 160
Table 12. Documentation 161
Table 13. Connecting Cables 161
Table 14. DS3/HST Redundancy Kit Part Number 162
Table 15. CMX Card Console Port Cables. 162
Table 16. Console Port Cables 168
Table 17. Alarm Port Cables 172
Table 18. RJ-45 Ethernet Port Cables. 175
Table 19. 75-ohm BNC Port Cables 180
Table 20. DB25 Port Cables 184
Table 21. Out of Warranty Repairs 201

About This Book

This book presents information that explains the concepts behind the design and operation of the Open Reliable Communications Architecture (ORCA) telephony gateway. Specifically, this book provides information on the RDT-8v release 2.0 gateway, the GX release 8.0 gateway, the RDT-8g release 7.0 gateway, and the BTX release 2.0 gateway. It provides system design and application information, and product features. The purpose of this information is to help you install, use, and maintain an ORCA gateway.

Who Should Use This Book

This book is for product distributors, systems integrators, systems analysts, and network administrators who design, install, configure, and maintain wide area networks (WANs) and large-scale communications applications. It contains conceptual and practical information about how to use the ORCA gateway within your network.

How To Use This Book

If the ORCA gateway is new to you, you should read all the chapters in this book to familiarize yourself with all of the product features and functions. In addition, see "ORCA User Library" on page vi for an annotated list of books in the ORCA library.

If your network is already functional, you can use the *ORCA Hardware Manual* to install a gateway, and then use the included software manual, (*e.g.*, *ORCA GX-Series Software Manual*) to learn how to use the Nuera network manage-

ment software to configure the gateway. If you need more information to help you integrate an ORCA gateway into your network, refer to the manuals that support your network components.

Conventions Used in This Book

This book uses specific conventions to show the following types of information:

- Number usage
- Replaceable input values
- Messages

Read the following sections to learn more about how this information is shown in the rest of the book.

How Numbers Are Used

When numbers are shown in this book, they can appear as descriptive values or as data to be manipulated internally. Decimal values are used frequently; however, alternate number bases are useful when internal data is shown.

Large Decimal Numbers

Numbers greater than 9999 display in SI metric style, where whole numbers that contain more than four digits are broken into groups of three digits that are separated by spaces. For example, the number sixteen thousand three hundred eighty three is shown as 16 383. This avoids confusion between American and European punctuation conventions.

However, a number that is internally manipulated by a computer is shown without punctuation or spaces. For example, notice how the value 65 535 appears in the following instruction without a space or a thousands separator within the number:

```
Specify 65535 as a maximum value
```

Numbers with Different Bases

All numbers shown in this book are decimal values unless the number base is binary or hexadecimal. There are two ways to show a number with a different base:

- An identifier can precede a binary or hexadecimal number. The following expressions use an identifier:
  - the value of binary 1010
  - the value of hex 4F
- A type-format indicator can precede a binary or hexadecimal number that is enclosed in single quotation marks. The following expressions use the binary and hexadecimal indicators:
  - B'1010'
  - X'4F'

Replaceable Input Values

In some cases, you can insert user-defined values into commands or you can specify local paths and filenames. These variable values are shown in *italic* typeface.

For example, you might be asked to specify the name of your server in this path:

A:\LOGIN\LOGIN *servername*

The italic typeface shows that you need to replace *servername* with your local server name.

When you are prompted for variable input that is represented by lower-case letters, follow these conventions:

When You See This Variable Value	Substitute This Value
b	Any binary digit
h	Any hexadecimal digit
n	Any decimal digit
x	Any alphabetic value, such as: ***x*:\DOS** where you substitute the correct drive letter for *x*
Multiple letters	A series of digits, such as: **FIRST 2 HEX BYTES: *hhhh*** where you substitute four hexadecimal digits for ***hhhh***

When you are prompted for variable input with embedded decimal points, replace the variable digits and let the decimal points remain to separate 32-bit dotted-decimal address segments. For example, you might be prompted to supply a 32-bit, dotted-decimal address in this format:

nnn.nnn.nnn.nnn

where ***nnn*** is a decimal value from 0 through 255. Leading zeros are not required.

Textual Callouts

This book uses two distinct symbols displayed in the textual margins to call the reader's attention to information that is of particular interest.

These callouts are presented and described below:

Note

This callout indicates that the information presented may be of particular use when operating an ORCA gateway or accompanying devices.

Caution

This callout indicates that the information presented may prevent damage to an ORCA gateway or accompanying device when operating the equipment or may prevent personal injury when installing, operating, or maintaining an ORCA gateway or accompanying devices.

Getting Help

If after installing and configuring your Nuera equipment, you cannot establish communications to or from the unit, carefully review the information in this book and in the other ORCA books prior to calling Technical Assistance Center (TAC).

Checklist

Ensure that you have checked the following possibilities:

1. Configuration of the console port. Check that the baud rate of your terminal is set to 9600 bps.
2. Reset the equipment. When cycling power, be sure to leave the power off for a minimum of 30 seconds before reapplying power to the unit.
3. Review the ORCA gateway commands. See the Configuration chapter of the *ORCA Gateway Hardware Manual*.
4. Check your software version. To ensure that all our customers have the latest enhancements and product features, Nuera ships every new or factory-upgraded unit

with the latest software version. Therefore, whenever you are installing or reinstalling units into your system, check each unit to verify that all units are equipped with identical software versions.

Last Resort

If after carefully reviewing the information in this book and in the other ORCA books, your problem persists, contact either your product representative or a service representative at Nuera's Technical Assistance Center. Prior to calling, ensure that you have assembled all the pertinent data that will assist in resolving your problem. These items include:

- A detailed description of your problem
- A complete listing of your system components and configuration. Include your unit's serial number and the software version number it is running
- A narrative of the actions you performed prior to the problem
- A list of all system messages posted by your unit.

Your Nuera service representative will advise you as to the appropriate course of action.

Contacts

Address:

Nuera Communications, Inc.
10445 Pacific Center Court
San Diego, CA 92121 USA
tac@nuera.com
www.nuera.com/support/

Telephone:

1-858-625-9220, Extension 1391
1-800-966-8372, Extension 1391

1

Overview

This overview is a high-level introduction to the ORCA gateway hardware components. ORCA gateways provide high-density voice transmission that enables high-quality, cost-efficient telecommunications service. This chapter explains the gateway design and the ORCA network design.

ORCA GX-Series Release 8.0 Overview

Currently, only the 21-slot chassis supports ORCA GX release 8.0.

An ORCA 21-slot gateway has the capacity to support up to 2016 channels of packetized voice over IP packets. It is able to interact with an external softswitch, such as Nuera's SSC Softswitch, for a switched network solution.

Design

This section presents high-level information about the design philosophy of the ORCA gateway platform. The ORCA gateway has been designed to serve carrier-grade environments that require:

- Open architecture
- High reliability
- High scalability
- Hot-swap capability
- Interoperability
- NEBS compliance

Open Architecture

The open architecture of the ORCA gateway facilitates interoperability with third-party softswitches, gateways, integrated access devices, and enhanced services platforms.

High-Reliability

The ORCA gateway's robust platform provides sufficient redundancy to guarantee high availability. Because ORCA gateways carry large amounts of revenue-producing voice traffic, hardware or software faults are contained and not permitted to affect other system resources.

The ORCA gateway design enables distributed execution of control and processes, while its hot-swap capability enables all cards to be easily replaced in case of failure. These modules do not require special tools to perform field replacement.

Control processes and signaling are backed up by a dual-processor configuration that has access to all the internal buses.

Scalability

The ORCA 21-slot chassis release 8.0 supports between 1 and 3 DS3s of voice traffic. This enables emerging carriers to enter the market with a relatively low cost entry level product, which can easily be expanded as their business continues to grow.

Hot-Swap Capability

The gateway's voice processing is performed by replaceable components that can be hot-swapped in the event of a failure. Control and switching modules are backed up by a dual-processor configuration that accesses all internal buses. In addition, power and fan modules are also redundant and hot-swappable.

Interoperability

The ORCA gateway products are based upon an open architecture and protocols common to both legacy and evolving voice/data networks. These include voice compression algorithms such as G.729, signaling systems, packet formats (IP), and networking protocols (MGCP and SIP). Because the architecture is software intensive, it is easy to select specific features for a given application in order to maximize performance and minimize cost.

ORCA gateways also interoperate with third-party gateways and softswitches, as well as with Nuera's own SSC softswitch. Nuera's gateways support the industry standard MGCP; Nuera's SSC supports MGCP and SIP.

NEBS Compliance

The ORCA gateway products are certified to be Network Equipment Building System (NEBS) Level-3 compliant. The rack depth of an ORCA gateway series chassis, for example, is suitable for mounting in a NEBS 24-inch-frame floor plan. For complete information regarding NEBS, see "Network Equipment Building System Generic Equipment Requirements", TR-NWT-000063, Issue 4, July, 1991.

Networking

The ORCA gateway product family is a networking system that provides highly efficient and reliable transmission of voice, voice band data (VBD), modem, and facsimile (fax) signals across a broad range of digital transmission facili-

ties. It uses advanced signal processing techniques to characterize and compress signal sources into data packets that are compatible with IP or leased-line wide-area networks (WANs).

The ORCA gateway can be employed as a trunking gateway between both local and/or toll switches, or as an access gateway.

ORCA Gateway

The cornerstones of an ORCA network are the ORCA Gateway components–the ORCA voice/media gateways. ORCA gateways create a telephone switching platform that provides network access for as many as 84 digital T1 subscriber interfaces on the 21-slot chassis. The associated voice channels originating from these interfaces are compressed, packetized, and routed across IP network backbones.

Ethernet connectivity and support functions, such as network management systems (NMS) connect to an ORCA gateway through one of the redundant 100Base-T or 1000BaseSX connections on the unit's HUB2X card. See Figure 1 on page 27.

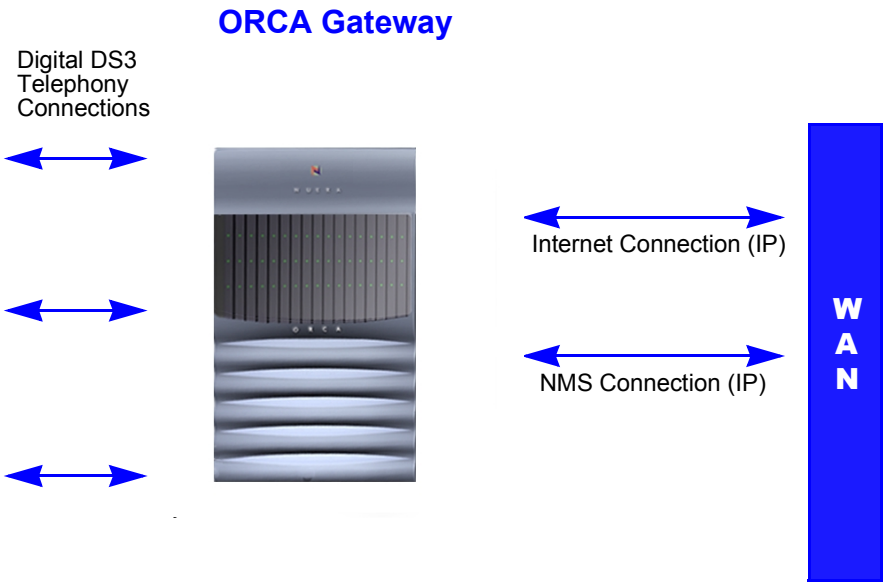


Figure 1. ORCA Gateway Connections

ORCA SSC Softswitch

The ORCA SSC softswitch provides the call processing and call control for one or more GX-Series gateways. The SSC is built on Hewlett-Packard server platforms.

The ORCA SSC centralizes and simplifies dynamic switching, routing, management, and call processing feature operations. While providing the network call processing and routing abilities, the SSC also provides a portal to enhanced services such as Interactive Voice Response (IVR), and voice/fax messaging.

The SSC and GX-Series gateways communicate using the Media Gateway Control Protocol (MGCP), enabling creation of geographically distributed softswitches. Using the MGCP protocol, the SSC controls the GX-Series units within its domain and thereby provides the functionality of a traditional telecommunications switch. The relationship between the GX-Series voice gateway and the ORCA SSC is that of client and server, respectively.

Primary Functions

The main tasks performed by the ORCA SSC are:

- Communicating with other network domains using signaling protocols such as SIP signaling protocol
- Providing signaling services such as MGCP and SS7 to the ORCA GX-Series gateway
- Routing calls to and from the ORCA SSC-managed network from other networks
- Managing call-related resources such as ports, trunks, and routes
- Recording call accounting data

Figure 2 shows the relationship of the ORCA SSC softswitch to the ORCA Gateway.

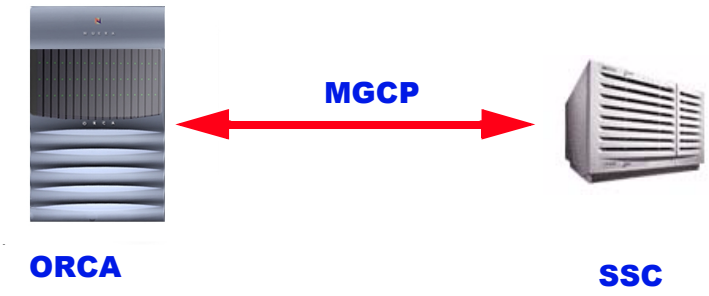


Figure 2. ORCA SSC

ORCA SSC Configuration

The ORCA SSC can be deployed individually or in redundant pairs to provide maximum network reliability.

A single SSC can support a network of up to twenty-five ORCA voice gateways. SSCs can also be deployed regionally and operate together to provide the call processing and switching structure for large scale networks.

ORCA RDT-8g Overview

Currently, only the 8-slot chassis supports ORCA RDT release 7.0.

Nuera's ORCA (Open Reliable Communications Architecture) RDT (Remote Digital Terminal) product is designed to bridge the gap between traditional, circuit-based Public Switched Telephone Networks (PSTNs) and the emerging packet-switched networks (*i.e.*, cable telephony). The ORCA RDT provides an excellent solution for merging digital broadband access networks with the legacy telephone network in a seamless, reliable manner. To accomplish this, the ORCA RDT supports Network Call Signaling (NCS), PacketCable's version of Media Gateway Control Protocol (MGCP) that defines a signaling connection between Voice-over-IP (VoIP) network devices. The RDT series also supports the GR-303 standard, which defines an interface between a digital switch that provides local service and an access concentrator.

ORCA Design

This section presents high-level information about the design philosophy of the ORCA RDT platform. The ORCA RDT has been designed to serve carrier-grade environments that require:

- Open architecture
- High availability with redundancy
- High scalability
- Hot-swap capability
- NEBS compliance

Open Architecture

The internal open architecture of the ORCA RDT facilitates third-party software development or integration of off-the-

shelf applications. By implementing a software version change, the ORCA RDT becomes capable of interfacing with an external, third-party soft switch.

High-Reliability

The ORCA RDT's robust platform provides sufficient fault tolerance and redundancy to guarantee high availability. Because ORCA RDTs carry large amounts of revenue-producing voice traffic, hardware or software faults are contained and not permitted to affect other system resources.

The ORCA RDT design enables distributed execution of control and processes, while its hot-swap capability enables all cards to be easily replaced in case of failure. These modules require no special tools or training to perform field replacement.

Control processes and signaling are backed up by a dual-processor configuration that has access to all the internal buses.

Scalability

The ORCA RDT supports between 1 and 16 T1s per chassis, using uncompressed, G.711 or G.726-32k packetized Voice-over-IP (VoIP) with GR-303 and NCS protocols. This enables emerging carriers to enter the market with a relatively low cost entry level product, which can easily be expanded as their business continues to grow.

Hot-Swap Capability

The RDT's voice processing is performed by resource cards that can be hot-swapped out in the event of failure. Control and switching modules are backed up by a dual-processor configuration that accesses all internal buses. In addition, power and fan modules are also hot-swappable.

NEBS Compliance

The ORCA RDT product is certified Network Equipment Building System (NEBS) Level-3 compliant. The rack depth of an ORCA RDT series chassis, for example, is suitable for mounting in a NEBS 24-inch-frame floor plan. For complete information regarding NEBS, see "Network Equipment Building System Generic Equipment Requirements", TR-NWT-000063, Issue 4, July, 1991.

Feature Summary

This section provides an overview of the ORCA RDT's features.

Voice Processing

- Built in adaptive echo cancellation with automatic convergence from 0–54 milliseconds
- Adaptive jitter buffer from 10–750 msec
- Advanced lost packet recovery (LPR)

Protocol Support

The ORCA RDT supports the following industry protocols:

GR-303

GR-303 defines an interface between a local digital switch (Central Office) and a remote digital terminal (RDT). GR-303 is a legacy PSTN protocol that has been in use since the early 90s. The PSTN forms temporary circuits, apportioning a dedicated, private channel between two speakers. GR-303 is used to define an access telephony network in front of a local exchange switched network. GR-303 protocol supports call processing and OAM&P functions required by the switches that are in the local exchange switched network.

Network Call Signaling (NCS)

NCS is PacketCable's version of Media Gateway Control Protocol (MGCP). Using NCS, the ORCA RDT can communicate directly with cable modems to establish a voice call. PacketCable is the industry consortium for definition and standardization of cable telephony networking.

Fax and Modem Support

The ORCA RDT supports Group III fax protocols V.17, V.21, V.27 and V.29 at baud rates up to 14.4 Kbps as well as high speed modem standards such as V.34. The fax and modem signals will be passed through the ORCA RDT with no degradation of performance.

Maintainability

The following list describes the salient maintainability features of the ORCA RDT:

- Hot-standby redundant capability on all control and switching modules. Live insertion and extraction of all modules
- Built-in test capability to identify and isolate failed modules
- Maintenance and configuration functions are performed remotely through the ORCA network management system

ORCA RDT-8v Overview

Currently, only the 8-slot chassis supports ORCA RDT releases 7.0 and 7.1.

Nuera's ORCA (Open Reliable Communications Architecture) RDT-8v (Remote Digital Terminal) product is designed to bridge the gap between traditional, circuit-based Public Switched Telephone Networks (PSTNs) and the emerging packet-switched cable telephony networks. The ORCA RDT-

8v provides an excellent solution for merging digital broadband access networks with the legacy telephone network in a seamless, reliable manner.

The ORCA RDT-8v is programmed to use and convert three different protocols that together make routing voice packets over different networks possible. The first set of protocols are G.711 PCM and G.726-32k ADPCM, which make the voice packets ready for transmission through IP networks. Both are standards for converting speech into discrete packets. The ORCA RDT also supports Network Call Signaling (NCS), PacketCable's version of Media Gateway Control Protocol (MGCP) that defines a signaling connection between Voice-over-IP (VoIP) network devices. Finally, the RDT-8v supports the V5.2 standard, which defines an interface between a digital switch that provides local service and an access concentrator.

The ORCA RDT-8v converts information in real time between all three protocols, forming IP packets from the PSTN PCM speech and sending them to a cable modem; or stripping off the encapsulation from the IP packets, reassembling the speech packets, and sending the PCM equivalent to the switch.

ORCA Design

This section presents high-level information about the design philosophy of the ORCA RDT-8v platform. The ORCA RDT-8v has been designed to serve carrier-grade environments that require:

- High availability with redundancy
- High scalability
- Hot-swap capability
- NEBS compliance

High-Reliability

The ORCA RDT-8v's robust platform provides sufficient fault tolerance and redundancy to guarantee high availability. Because ORCA RDT-8vs carry large amounts of revenue-producing voice traffic, hardware or software faults are contained and not permitted to affect other system resources.

The ORCA RDT-8v design enables distributed execution of control and processes, while its hot-swap capability enables all cards to be easily replaced in case of failure. These modules require no special tools or training to perform field replacement.

Control processes and signaling are backed up by a dual-processor configuration that has access to all the internal buses.

Scalability

The ORCA RDT-8v release 7.1 supports between 2 and 16 E1s per chassis, using uncompressed, G.711 or compressed G.726-32k packetized Voice-over-IP (VoIP) and V5.2/NCS protocols. This enables emerging carriers to enter the market with a relatively low cost entry level product, which can easily be expanded as their business continues to grow.

Hot-Swap Capability

The RDT-8v's voice processing is performed by resource cards that can be hot-swapped out in the event of failure. Control and switching modules are backed up by a dual-processor configuration that accesses all internal buses. In addition, power and fan modules are also hot-swappable.

NEBS Compliance

The ORCA RDT-8v product is certified Network Equipment Building System (NEBS) Level-3 compliant. The rack depth of an ORCA RDT series chassis, for example, is suitable for mounting in a NEBS 24-inch-frame floor plan. For complete

information regarding NEBS, see “Network Equipment Building System Generic Equipment Requirements”, TR-NWT-000063, Issue 4, July, 1991.

Feature Summary

This section provides an overview of the ORCA RDT-8v’s features.

Voice Processing

- Built in adaptive echo cancellation with automatic convergence from 0–54 milliseconds
- Adaptive jitter buffer from 10–750 msec
- Advanced lost packet recovery (LPR)

Protocol Support

The ORCA RDT-8v supports the following industry protocols:

V5.2

In order to produce a stable, high performance application, the ORCA RDT-8v uses third-party V5.2 stack software provided by Aztek Engineering, Inc. This stack, selected for its reliability and proven interoperability with various switches (including Nortel DMS 100) and country requirements, meets ETSI specifications for the V5.2 protocol, and provides the application software for the Access Network (AN) side of the V5.2 interface. In addition, the V5.2 protocol may use up to sixteen 2,048 kbit/s links on one interface. It supports concentration using a dedicated protocol called the Bearer Channel Connection (BCC), it has a communication channel protection function when the interface uses more than one 2,048 kbit/s link, and it includes a link control protocol to manage multiple links.

More information regarding the V5.2 protocol can be found on ETSI’s web site at http://www.etsi.com/.

Network Call Signaling (NCS)

NCS is PacketCable's version of Media Gateway Control Protocol (MGCP). Using NCS, the ORCA RDT-8v can communicate directly with cable modems to establish a voice call. PacketCable is the industry consortium for definition and standardization of cable telephony networking.

Fax and Modem Support

The ORCA RDT supports Group III fax protocols V.17, V.21, V.27 and V.29 at baud rates up to 14.4 Kbps as well as high speed modem standards such as V.34. The fax and modem signals will be passed through the ORCA RDT with no degradation of performance.

Maintainability

The following list describes the salient maintainability features of the ORCA RDT-8v:

- Hot-standby redundant capability on all control and switching modules. Live insertion and extraction of all modules
- Built-in test capability to identify and isolate failed modules
- Maintenance and configuration functions are performed remotely through the ORCA network management system

ORCA BTX-Series Overview

Currently, only the 8-slot chassis supports ORCA BTX release 1.0.

Nuera's ORCA (Open Reliable Communications Architecture) BTX (Broadband Telephony Exchange) product is designed to bridge the gap between traditional, circuit-based Public Switched Telephone Networks (PSTNs) and the

emerging packet-switched networks. The ORCA BTX provides an excellent solution for merging digital broadband access networks with the legacy telephone network in a seamless, reliable manner. To accomplish this, the ORCA BTX supports PacketCable standards.

ORCA Design

This section presents high-level information about the design philosophy of the ORCA BTX platform. The ORCA BTX has been designed to serve carrier-grade environments that require:

- Open architecture
- High availability with redundancy
- High scalability
- Hot-swap capability
- NEBS compliance

Open Architecture

The internal open architecture of the ORCA BTX facilitates third-party software development or integration of off-the-shelf applications. The ORCA BTX is capable of interfacing with an external, third-party soft switch.

High-Reliability

The ORCA BTX's robust platform provides sufficient fault tolerance and redundancy to guarantee high availability. Because ORCA BTXs carry large amounts of revenue-producing voice traffic, hardware or software faults are contained and not permitted to affect other system resources.

The ORCA BTX design enables distributed execution of control and processes, while its hot-swap capability enables all cards to be easily replaced in case of failure. These modules require no special tools or training to perform field replacement.

Control processes and signaling are backed up by a dual-processor configuration that has access to all the internal buses.

Scalability

The ORCA BTX supports between 1 and 16 T1s per chassis, using uncompressed, G.711 packetized Voice-over-IP (VoIP). This enables emerging carriers to enter the market with a relatively low cost entry level product, which can easily be expanded as their business continues to grow.

Hot-Swap Capability

The BTX's voice processing is performed by resource cards that can be hot-swapped out in the event of failure. Control and switching modules are backed up by a dual-processor configuration that accesses all internal buses. In addition, power and fan modules are also hot-swappable.

NEBS Compliance

The ORCA BTX product is certified Network Equipment Building System (NEBS) Level-3 compliant. The rack depth of an ORCA BTX series chassis, for example, is suitable for mounting in a NEBS 24-inch-frame floor plan. For complete information regarding NEBS, see "Network Equipment Building System Generic Equipment Requirements", TR-NWT-000063, Issue 4, July, 1991.

Feature Summary

This section provides an overview of the ORCA BTX's features.

Voice Processing

- Built in adaptive echo cancellation with automatic convergence from 0–54 milliseconds
- Adaptive jitter buffer from 10–750 msec

- Advanced lost packet recovery (LPR)

Protocol Support

The ORCA BTX supports the following industry protocols:

- MGCP
- TGCP
- ISDN

TGCP

The PSTN Trunking Gateway Call Signaling Protocol 1.0 is a profile of MGCP derived from MGCP Version 1.0 IETF RFC 2705. The TGCP profile defines naming conventions, the usage of the session description protocol (SDP), and the procedures that compose TGCP.

ISDN

Integrated Services Digital Network (ISDN) is a digital, worldwide public standard for sending voice and data packets over the public switched telephone network. ISDN networks extend from the local telephone exchange to the remote user and include all of the telecommunications and switching equipment in between.

PacketCable Compliance

PacketCable is a project conducted by Cable Television Laboratories, Inc. (CableLabs) and its member companies. The PacketCable project defines interface specifications to be used to develop interoperable equipment capable of providing packet-based voice, video and other high-speed multimedia services over hybrid fiber coax (HFC) cable systems using the DOCSIS 1.1 protocol.

The BTX-8 fulfills the role of a Media Gateway between the packet network and the PSTN. PacketCable qualification is achieved by successfully completing an Acceptance Test Plan (ATP). ATPs consist of Compatibility Test Plans (CTPs). The Media Gateway ATP consists of three (3) CTPs: TGCP, Codec and Security. Two (2) CTPs are complete and

released: TGCP and Codec. The BTX-8 release 1.0 supports the functionality to comply with all aspects of the TGCP and Codec CTPs.

Fax and Modem Support

The ORCA BTX supports Group III fax protocols V.17, V.21, V.27 and V.29 at baud rates up to 14.4 Kbps as well as high speed modem standards such as V.34. The fax and modem signals will be passed through the ORCA BTX with no degradation of performance.

Maintainability

The following list describes the salient maintainability features of the ORCA BTX:

- Hot-standby redundant capability on all control and switching modules. Live insertion and extraction of all modules
- Built-in test capability to identify and isolate failed modules
- Maintenance and configuration functions are performed remotely through the ORCA network management system

2

Chassis and Components

This chapter presents the functional architecture of the ORCA 21- and 8-slot gateways. It introduces the major gateway components, their functions, and inter-activities.

All chassis logic modules, power supplies, and the fan modules reside in a 21-slot, compact PCI (cPCI) chassis. Each slot permits the installation of a front and a rear card module separated by a midplane, which is functionally equivalent to a backplane. For more information on the ORCA gateway logic modules, see "ORCA Gateway Card Modules" on page 51. The 8-slot gateway uses the same logic modules and midplane design as a 21-slot chassis.

Chassis Overview

Dimensions

The 21-slot chassis encloses a card cage, two power supply modules at the bottom of the chassis, and two fan modules at the top. The chassis, which is made in compliance with the cPCI specification, fits into an Electronics Industry Association (EIA) standard 19-inch rack and houses 21 single-width cards. The chassis is 28 inches tall.

The 8-slot chassis encloses a card cage, four power supply modules at the top of the chassis, and two fan trays on either side of the chassis. The chassis is also made in compliance with the cPCI specification and the EIA 19-inch standard racks. The BTX-8 chassis is 10.5 inches tall and houses 8 single-width cards.

Intercard Signals

Many intercard signals can be grouped as busses described as follows:

H.110 Bus

This is the ECTF standard PCM highway. It provides 32 8.192 MHz highways for a total capacity of 4096 64Kbps channels.

100Base-T LANs A/B

These are two independent, 100Base-T ethernet LAN segments per slot supported by redundant, switched HUB2 modules.

Auxiliary Bus

This bus provides miscellaneous interconnects. Signal functions include: power-supply monitor and control, system resets, power, fan monitor and control, temperature monitor, alarms, and hot-swap status and control.

PCI Standards

The ORCA hardware system implements the industry standard compact PCI (cPCI) specification. cPCI enables the porting of IBM PC architecture to an industrial-grade platform. The PCI bus used by most Pentium-based PCs is the core of the cPCI electrical specification.

The backplane PCI bus has a high-speed, impedance-controlled design.

Power Supplies

The two power supplies are accessible from two drawers at the bottom front of the ORCA 21-slot chassis. On the 8-slot chassis, the four power supplies are accessible from the front top of the chassis. All modules operate in parallel with each other and are hot-swappable. If any power supply fails, sufficient power continues to be available from any remaining supplies.

Power modules are equipped with single line inputs to support two separate power grids. Input line power is not bussed.

For information on how to hot-swap the power modules, see "21-Slot Chassis Power Modules" on page 116 for the 21-slot chassis, or see "8-Slot Chassis Power Modules" on page 121 for the 8-slot chassis.

Fan Modules

In the ORCA 21-slot chassis, cooling is provided by two fans installed in side-by-side hot-swappable trays located at the top of the enclosure. The fans draw air into the bottom of the unit. It then traverses upward past the card modules and exits from the top rear of the unit.

In the ORCA BTX-8, cooling is provided by two hot-swappable fan trays installed on each side of the unit. The fan trays draw air from the air inlet located on the right side of the unit to the exhaust vent located on the left rear side of the unit.

The ORCA gateway system detects fan operational status through a tachometer reading. If fan output is compromised by failure or loss of rotational speed, an alarm condition is reported by the CM module. The failed module can then be replaced while the ORCA gateway is powered on, thereby restoring full cooling capacity to the gateway.

For information on hot-swapping the fan modules, see "21-Slot Chassis Ventilation" on page 121 for the 21-slot chassis, or see "8-Slot Chassis Ventilation" on page 123 for the 8-slot chassis.

21-Slot Base Unit

Front View

Figure 3 on page 45 shows the front view of an ORCA 21-slot chassis gateway with the front cover removed. At the top of the unit are two removable fan modules. The front card cage is directly below the fans. For the GX-Series release 8.0, placement of the CM, HUB2, and UPM3 cards must match the placement in the following list:

- Slot 1: HUB2
- Slot 2: CM
- Slot 3-4: UPM3 cards
- Slot 5: HST
- Slot 6-11: UPM3 cards
- Slot 12: HST
- Slot 13: HUB2
- Slot 14: CM
- Slot 15-20: UPM3 cards

Note

The quantity and placement of the UPM3 cards in the chassis is dependent upon the required vocoder groups and number of DS3s needed. For more information on GX-Series release 8.0 DS3 channel mapping, please see the accompanying software manual.

Directly below the card cage is the air intake area. Air is drawn upward by the fans above. At the bottom of the unit are two power supply modules, each with an air intake fan.

All cards can be hot-swapped.

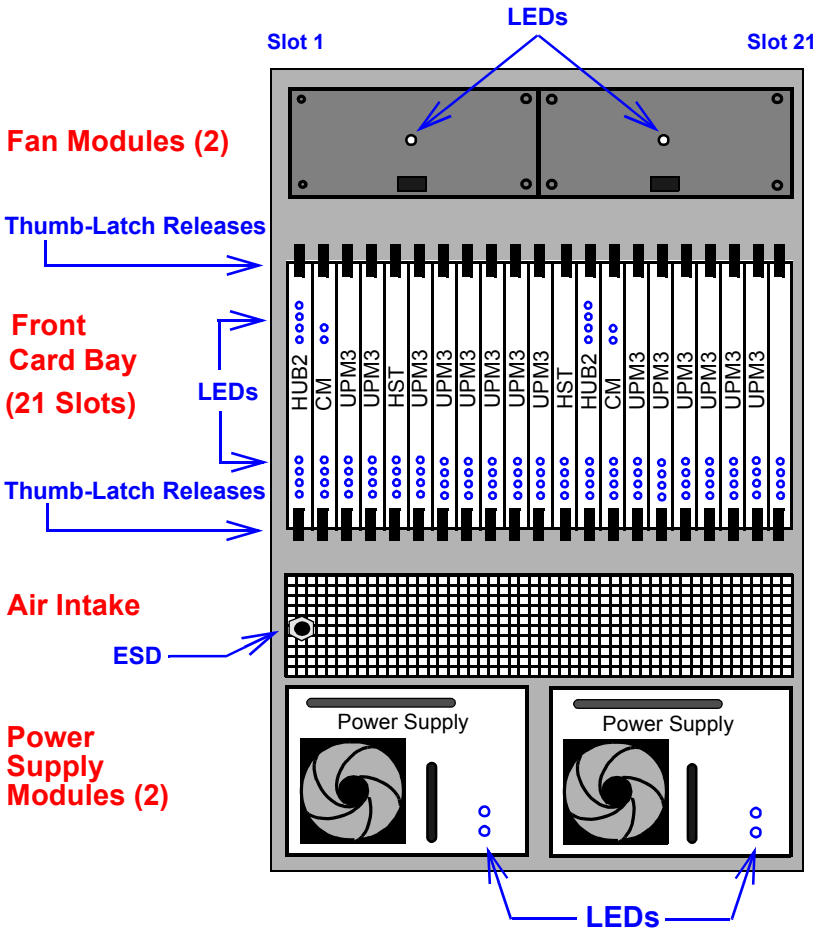


Figure 3. ORCA Gateway 21-Slot chassis, Front View (Cover Removed)

Back View

Figure 4 on page 47 shows a view of an ORCA gateway 21-slot chassis from the back. At the top of the unit is an air exhaust area. Air, which is drawn in at the bottom front of the unit by the dual fans, is expelled here. The rear card cage is located directly below the air exhaust outlet.

For the GX-Series release 8.0, placement of the CMX, HUB2X, HSTX, and Bridge cards, which provide interfaces to external units, must match the placement in the list below. All cards in all releases must be installed in the same rear slot number as their respective front card:

- Slot 1: HUB2X
- Slot 2: CMX
- Slot 5: HSTX
- Slots 7-10: Bridge card
- Slot 12: HSTX
- Slot 13: HUB2X
- Slot 14: CMX

Below the card cage and to the left of the unit is an electrostatic discharge (ESD) connector. Dual AC and dual DC power connections are at the bottom of the unit. All components can be hot-swapped. See Figure 4 on page 47.

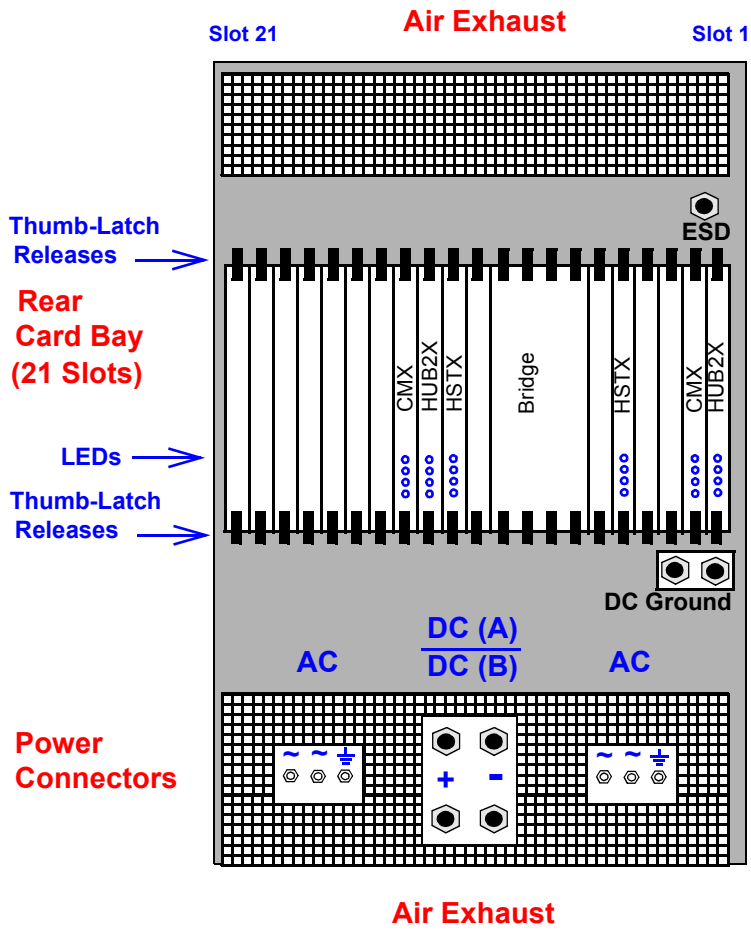


Figure 4. ORCA Gateway 21-Slot chassis, Back View

8-Slot Base Unit

Front View

Figure 5 on page 49 shows the front view of an ORCA 8-slot gateway with the front cover removed. At the top of the unit are four removable power supply modules. The front card cage is directly below the power supplies. At the sides of the unit are two removable fan trays. Placement of the CM, HUB2, and UPM cards must match the following list:

- Slot 1: HUB2
- Slot 2: CM
- Slot 3-6: UPM3/UPM4
- Slot 7: HUB2
- Slot 8: CM

Note

Currently, the UPM4 module is only available for use with the RDT-8v (V5.2) gateway. All other gateways use the UPM3 module.

To the right of the card cage is the air intake area. Air is drawn inward by the intake fan module. Air is exhausted from the rear of the chassis by the exhaust fan module located at the left front of the chassis.

All cards and fan trays can be hot-swapped.

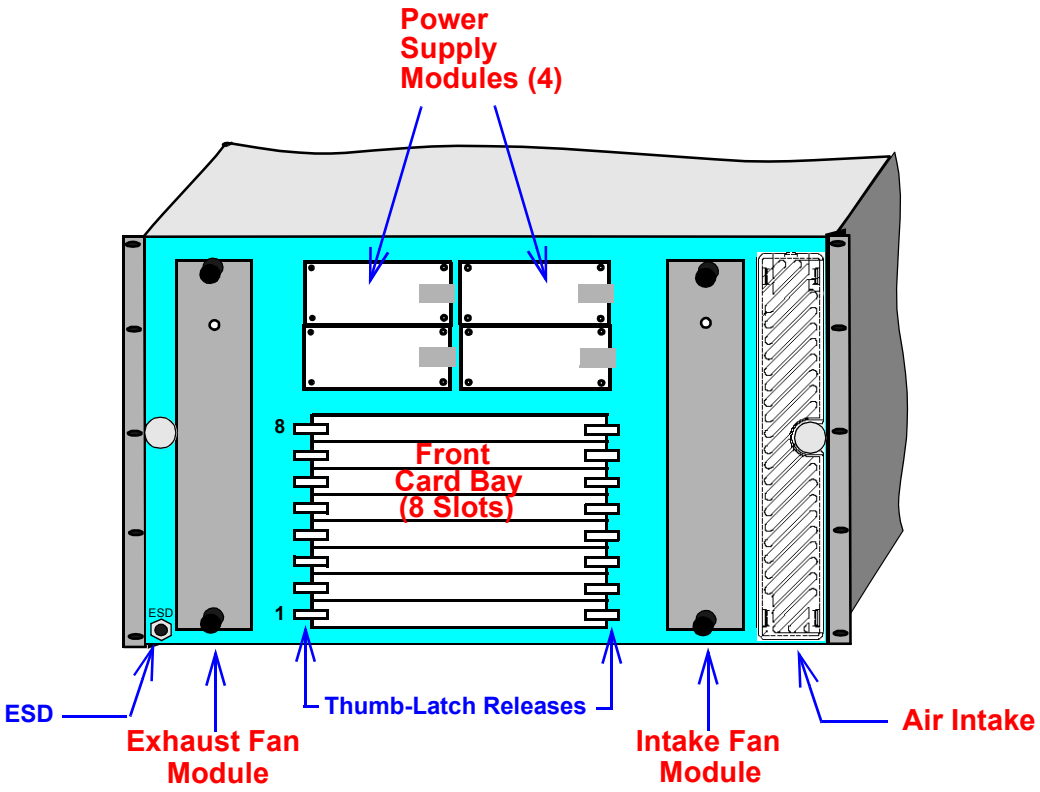


Figure 5. ORCA Gateway 8-Slot chassis, Front View (Cover Removed)

Back View

Figure 6 on page 50 shows a view of an ORCA gateway 8-slot chassis from the back. At the right of the unit is an air exhaust area. Air which is drawn in at the left front of the unit by the intake fan module is expelled here. The rear card cage is located directly to the left of the air exhaust outlet.

Placement of the CMX, HUB2X, and UPMX cards, which provide interfaces to external units, must match the list below. All cards must be installed in the same rear slot number as their respective front card:

- Slot 1: HUB2X
- Slot 2: CMX
- Slots 3-6: UPMX

- Slot 7: HUB2X
- Slot 8: CMX

At the top left of the rear of the unit is an electrostatic discharge (ESD) connector. Dual AC power connections and switches are located at the top center of the unit. All components can be hot-swapped. See Figure 6 below.

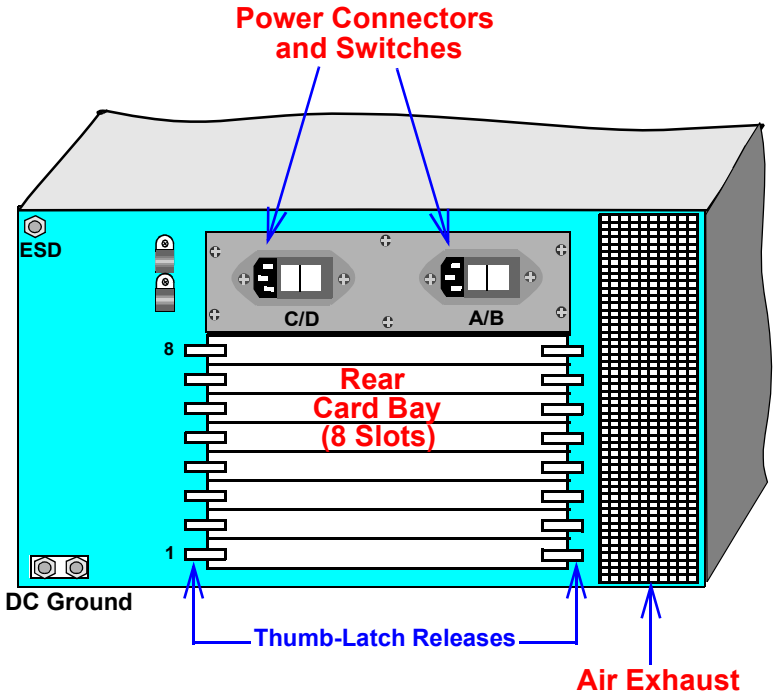


Figure 6. ORCA Gateway 8-Slot chassis, Back View

3

ORCA Gateway Card Modules

This chapter describes the function, features, and hardware connections of every ORCA gateway card module.

Front Cards

This section describes the various cards that occupy the ORCA gateway front card cage. The front cards, which include the CM, CM3, HUB2, HST, UPM3 and UPM4 modules, perform the majority of the unit's logical operations. They are accessed from the card cage in the front of the unit.

The following table lists the cards as they are used in each product release:

	CM	CM3	HST	HUB2	UPM3	UPM4
GX-21 R. 8.0		X	X	X	X	
RDT-8g R. 7.x	X			X	X	
RDT-8v R. 7.x	X			X		X
BTX R. 2.0				X	X	

Table 1. Front Card Usage Matrix

CM Module

The control module (CM) controls and coordinates all resources within an ORCA chassis. All configuration and control processes pass through the active CM before being distributed to other boards.

To avoid the failure of system control, two identical control clusters are used to control two LANs. Each control cluster consists of two pairs of modules (CM/CMX and HUB/HUBX) which independently control a LAN. The control clusters are labeled either A or B in association with the two LANs, also labeled A and B. The labels do not imply primary/secondary or online/offline operation.

In the event the active cluster fails, the system switches automatically to the offline (standby) cluster. This hand-off of control provides continuous system operation in the event of a control cluster failure. The failed (newly offline) cluster can then be replaced.

CM3 Module

The CM3 module is an updated version of the CM module, designed with the processing power to handle the higher traffic load of multiple DS3 connections found in the GX-Series release 8.0 product. The CM3 is available only for that product.

HST Module

The High Speed Telecom (HST) module, together with the HSTX module, provide the high-speed interface for the ORCA gateway. Its function is to perform multiplexing on the incoming DS3 channels. The HST splits out the 2016 bi-directional PCM channels and delivers the payload to the various UPM3 modules for processing and packetization

using the H.110 interface. The HST also performs inverse multiplexing and framing for outgoing signals.

HUB2 Module

The HUB2 module is an ethernet switch with segments to all other modules. The internal LANs enable the CM, UPMs, HSTs, and the external LAN to transfer control, status, and payload data with each other. A gateway chassis has two HUB2s, each servicing one of the two internal LANs.

The HUB2 is a switched hub; it divides its transmit and receive time between any number of concurrent connections, allowing data to pass through the HUB2 rapidly and efficiently. The HUB2 also supports simultaneous two-way traffic with full and half duplex modes and supports the HUB2X which has a gigabit or a 100 Mbps ethernet interface.

UPM3 Module

The Universal Processor Module (UPM3) is the payload processing module of the gateway. It is responsible for processing and packetization of the traffic on the voice channels within the ORCA gateway.

The UPM3 is processor intensive, having multiple digital signal processors (DSPs) controlled by a high-capacity microprocessor. It supports:

- Ethernet LAN segments (2)
- DSPs (8)
- H.110 interface

UPM4 Module

The UPM4 module is an updated version of the UPM3 module, designed with a faster processor to handle the higher

traffic load of multiple E1 connections found in the RDT-8v product. The UPM4 is currently available only for the RDT-8v.

Transition (Back) Cards

The back cards, or transition modules, provide all of the interfaces to equipment outside of the unit.

The following table lists the cards as they are used in each product release:

	CMX	HSTX	HSTX Bridge	HUB2X 1000SX	HUB2X 100T	LoadX	UPMX
GX-21 r. 8.0	X	X	X	X		X	
RDT-8g r. 7.x	X				X		X
RDT-8v r. 7.x	X				X		X
BTX r. 2.0	X				X		X

Table 2. Back Card Usage Matrix

CMX Module

The mating back slot card for the CM is the CM Transition module (CMX).

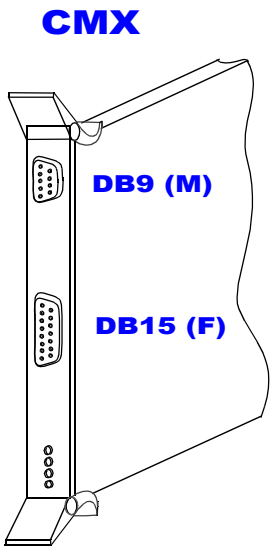


Figure 7. CMX Ports

Primary Functions

The CMX performs the following tasks:

Hot swap status and control

Handles all signals required for high-availability hot swapping of all ORCA gateway modules.

Alarms

Supports contact closure alarm generation and detection with three levels of severity.

Fan monitor

Receives status of cooling fans.

Power monitoring

Monitors power supply status lines in order to sense problems in either input or output voltages. Provides power status interface to the CM card.

Connectors

The CMX has the following ports:

- One console port, which is available for basic unit configuration through a DB9 (M) connector. Only RS232 electrical levels are supported for this port.
- One alarm port, which is available through a DB15 (F) connector, providing three output closures and three closure-detection inputs.

HSTX Module

The High Speed Telecom Transition module (HSTX) provides the connection between the DS3 interface and the

HST. It also provides clock jitter attenuation functions on incoming traffic.

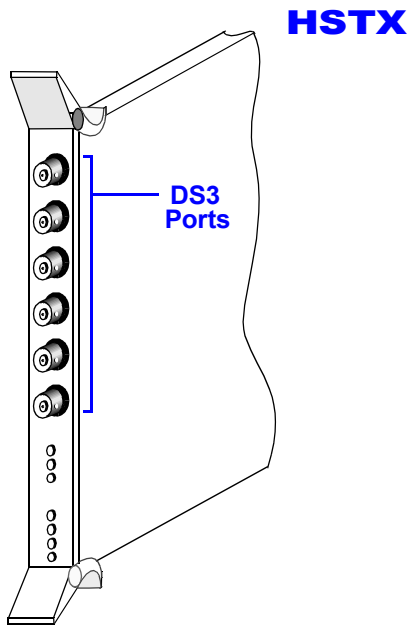


Figure 8. HSTX Module Ports

The HSTX performs the following task:

Telco Interfaces

The HSTX has three 75 ohm BNC-type connectors. Each connector serves as the interface to an independent DS3 line.

HSTX Bridge Module

The bridge module is a passive card that provides system redundancy. It is a flat panel that spans the width of four card slots between the two HSTX modules. The module has BNC connectors set in a column in the middle of the module; they link the DS3 trunks to the gateway. The module has six more sets of Tx/Rx BNC connectors that, once connected to each HSTX, split each DS3 trunk into two identical trunks,

routing one to the active HSTX and the other to the standby HSTX, thereby ensuring system redundancy.

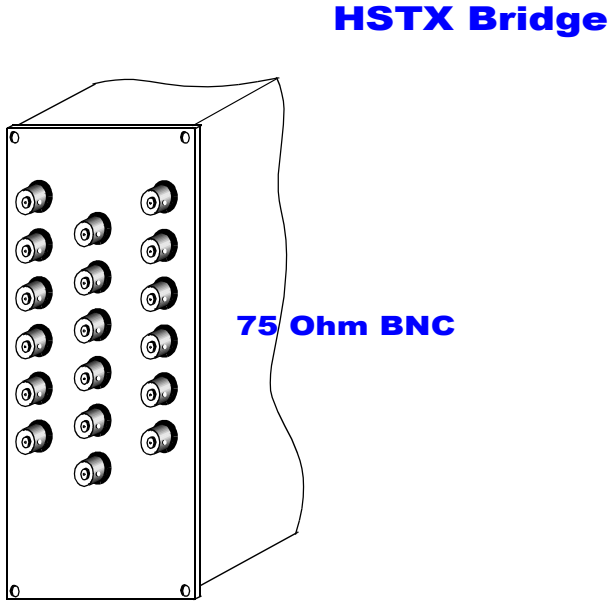


Figure 9. HSTX Bridge Module Ports

HUB2X Modules

The HUB2X is a straightforward interconnect card. There are two versions of the HUB2X card: the 1000Base-SX model and the 100Base-T model.

HUB2X-1000Base-SX

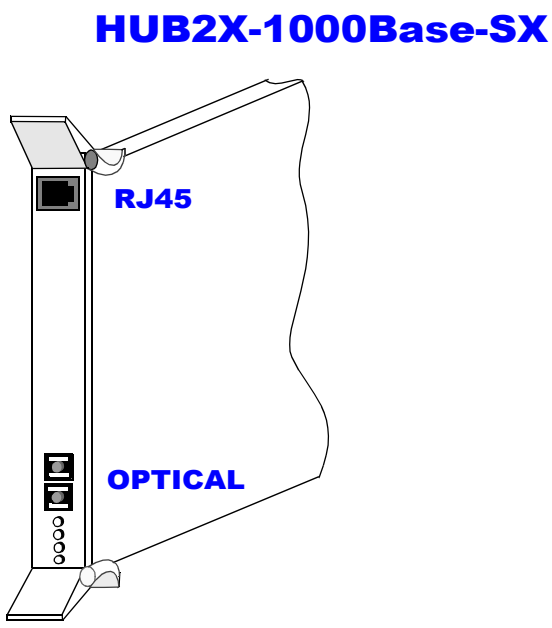


Figure 10. HUB2X-1000Base-SX Ports

Primary Functions

The HUB2X 1000Base-SX (21-slot chassis compatible only) model performs the following tasks:

1000Base-SX Interconnection

Routes a 1000Base-SX link from the HUB2 card to one optical gigabit ethernet connector, thereby enabling a 1000Base-SX external LAN connection to the internal buses.

100Base-T Configuration Port

The 100Base-T port is also provided for a 100Base-T connection from an external LAN to the internal buses.

Connectors

The single optical connector provides a 1000Base-SX connection, and a RJ45 connector provides a 100Base-T

ethernet connection. The two ports cannot be used simultaneously.

HUB2X-100Base-T

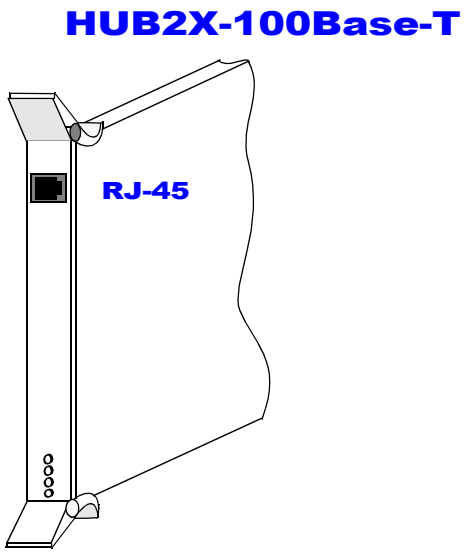


Figure 11. HUB2X-100Base-T Ports

Primary Functions

100Base-T Interconnection

Routes a single 100Base-T link from the HUB2 card to an ethernet connector, thereby enabling external LAN connections to the internal buses.

Connectors

The single RJ45 connector provides a 100Base-T ethernet connection.

Load Transition Module

One LoadX card is shipped with every 21-slot system and is used on the 21-slot chassis only. The LoadX card is required to satisfy the power supplies' minimum load requirement when the gateway is not fully loaded. The LoadX card is fac-

tory-installed or is shipped as a spare when the system is purchased with a full compliment of cards. The LoadX card should be installed into any back slot intended for UPMX cards whenever the 21-slot chassis is not fully loaded.

UPMX Module

The Universal Processor Transition module (UPMX) provides the connection between the T1/E1 interface and the UPM3/UPM4.

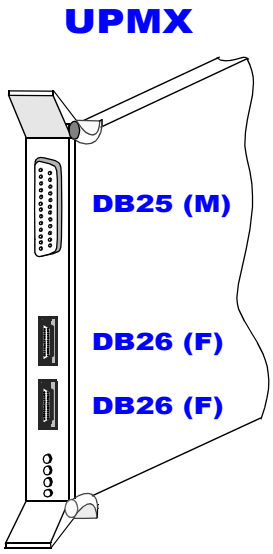


Figure 12. UPMX Card Ports and Connectors

Primary Functions

The UPMX performs the following task:

Telco Interfaces

Serves as an interface to a T1/E1 trunk.

Dual serial ports exist on the card, but are not supported.

Module Redundancy

The ORCA gateway is designed to allow for a distributed execution of control and processes to minimize service loss due to module failure. In the event of module failure, components can be hot-swapped, thereby permitting the gateway to continue in operation.

Voice processing is performed by resource cards that can logically be swapped out in the event of a failure. Control processes are backed up by a dual-processor configuration that has access to all of the internal buses.

Control Clusters

Central to the ORCA gateway design are functional groups of plug-in modules called control clusters. A control cluster consists of related CM, CMX, HUB2, and HUB2X modules. ORCA gateway design provides two control clusters; one cluster is a redundant backup for the other.

In normal operation, the active CM monitors operational status of its cluster (HUB2, HUB2X, CMX) by monitoring individual cluster members. It also polls all UPM3 and HST modules through the ORCA internal bus system.

The standby CM monitors activity in the active cluster and its own cluster, mirroring activity in the active cluster without assuming control of the bus system. The standby CM also monitors activity of all UPM3 and HST modules.

In the event of a failure, or a loss of performance in the active control cluster, the ORCA gateway can automatically notify the NMS and switch control to its standby control cluster, thereby maintaining the system in service.

The ORCA gateway then continues operation under control of the redundant control cluster indefinitely, until a failure or loss of performance again initiates switchover. (This can

also be activated by issuing the appropriate command from the Nuera Configurator.)

After a switchover, the now inactive control cluster can be diagnosed and repaired and returned to a “warm” standby state.

Note

The standby control cluster does not respond to console commands.

HST Clusters

A HST cluster consists of related HST and HSTX modules. ORCA gateway design provides two HST clusters; one cluster is a redundant backup of the other. In normal operation, the active CM monitors the operational status of both HST clusters as well as the DS3 alarm status. In the event of a failure, either on the card or on a DS3 port, the active CM can switch the active HST cluster.

If the CM sees the same DS3 port alarms on both HST clusters, it will not switch the active HST cluster. This redundancy feature allows active calls to proceed with minimal disruption when a fault to one of the HST clusters occurs.

4

Installing the ORCA 21-Slot Chassis

An ORCA gateway ships with all of its cards installed, making on-site hardware installation a simple process. The hardware installation section contains a list of necessary equipment and step by step instructions.

Nuera provides a sophisticated graphical user interface (GUI) for system configuration, monitoring, and troubleshooting. These functions are performed by one of two solutions: the Nuera Configurator or NueraView. See the software manual (e.g., GX or RDT) for more information.

Installation Preparation

There are numerous preparations that should be performed prior to installing a gateway. The following information should allow you to prepare the installation site to met the gateway's requirements and guidelines.

Site Environment Guidelines

Power Requirements

The site must provide either:

- 100- 250V~ (VAC), 50/60Hz, 15A max.,
- or -42 to -62.5 V ⎓ (VDC), 30A max.

main power to each power supply module installed in the gateway. Each power feed must deliver 1.2 Kilowatts minimum power per gateway. Nuera recommends redundant power supply feeds to ensure the continuous operation of the gateway.

AC units should be wired using 14 AWG wire. DC units should be connected using 10 AWG wire. For more details on the power requirements, see "Specifications" on page 147.

Space Allocation Guidelines

The gateway can be installed in an open rack, or in an enclosed cabinet as required by the site. The following installation options are currently supported:

- Open rack (provided by the site): EIA standard 19” rack used in an interior installation only. The 21-slot chassis can be front-mounted or center mounted in the rack. A single gateway requires 26.25” of vertical rack space, and 20” of rack depth.
- Enclosed environmental cabinet supplied by the site.
- A 23” Open rack can be used with adaptor mounts.

Airflow Requirements

Each 21-slot gateway is equipped with dual fan modules capable of providing 500 CFM of forced-air ventilation. The air intake is located on the lower front and side sections of the chassis, just above the power supplies. To prevent overheating, the air intake must not be obstructed. The exhaust

vent is located on the upper 3.5" section on the rear of the gateway. The ambient temperature of the installation site must not exceed 50 C.

The gateway produces heat at a maximum of 4500 BTUs per hour. The facility air conditioning system must be capable of handling system cabinet heat to reduce the system cabinet air temperature to an acceptable level for proper operation. The air conditioning system specifications should provide this information. Also, Nuera recommends that the limit for ambient dust content per cubic foot of air is 7,000 particles of one-micron size or larger. The air conditioning system specifications should provide this information as well.

Necessary Tools

ORCA Gateway Components

Before installing a 21-slot ORCA gateway into your network, make sure that in addition to this guide, your shipping package contains the following items:

- Pre-assembled ORCA gateway 21-slot chassis (with card modules installed)
- Locking front door
- Two power supply modules
- Cable kit (optional)
- all ORCA gateway documentation and software

Tools

Depending on the type of installation, you may require the following tools:

- Punch tool
- Digital multimeter
- Telephone test set
- A set of hand tools (such as cordless screwdriver, #2 Phillips screwdriver, 5/16" flat blade screwdriver, SAE wrenches)

- Standard crimper tool
- Transmission test set (DS3 applications)

Safety Precautions

Caution

- *The ORCA 21-slot chassis with power modules removed weighs approximately 110 lbs. Ensure that adequate manpower is available before attempting to remove the chassis from its shipping crate.*
- *For DC-powered gateways, connection to the -48 VDC power supply must be made with AWG 10 wires optionally supplied with the ORCA gateway. These AWG 10 wires must be secured by the cable clamps on the gateway and to the shelf (or rack) every 6 inches (15.24 CM3) thereafter.*
- *For AC-powered gateways, connection to the AC line must be made with AWG 14 wires optionally supplied with the ORCA gateway. These AWG 14 wires must be secured by the cable clamps on the gateway and to the shelf (or rack) every 6 inches (15.24 CM3) thereafter.*
- *When installing or modifying telephone lines:*
  - *Never install telephone wiring during a lightning storm.*
  - *Never install telephone jacks in wet locations.*
  - *Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.*
  - *Before connecting an ORCA gateway to a data communications or telecommunications network, ensure that a qualified professional verify that the gateway is connected to a safety/earth ground both through the AC mains connector and directly through the terminal at the rear of the chassis.*

Installing the Chassis

The ORCA 21-slot shipping crate is sealed with approximately 17 lag bolts. Use a 7/16" SAE socket wrench with a ratchet handle or other appropriate tool to remove the bolts. Ensure that the shipping crate is in its upright position prior to removing the lag bolts.

The front panel can then be removed, providing access to the ORCA 21-slot chassis and ancillary equipment.

When choosing the location to physically install the ORCA gateway and the mounting racks, it must be in a restricted access location, where access can be gained only by service personnel or by users who have been instructed in the precautions that must be taken. Also, proper security measures should be taken into consideration.

The ORCA 21-slot chassis is shipped with system front and rear card modules and fan modules installed. It is positioned within the shipping crate in its upright position. A blank panel is mounted over the two power supply bays to maintain the card cage in a rigid state during shipment. See Figure 13:

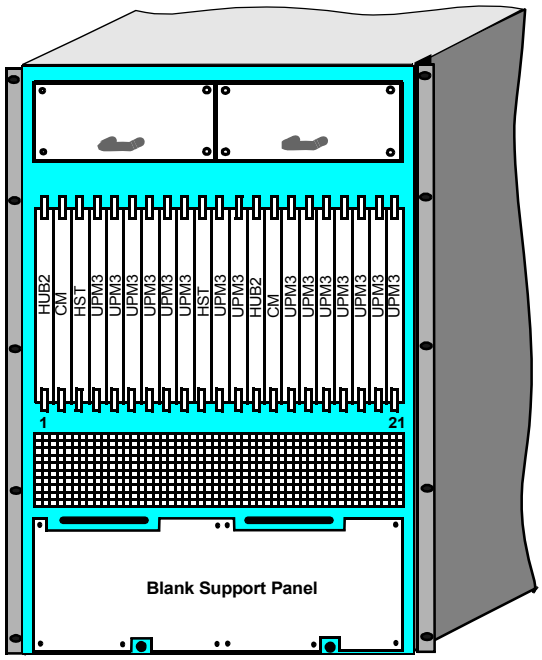


Figure 13. ORCA 21-Slot Chassis

Caution

The ORCA 21-slot chassis with power modules removed weighs approximately 110 lbs (50kg). Ensure that adequate manpower is available before attempting to remove the chassis from its shipping crate.

1. Remove the ORCA 21-slot chassis from its shipping container. Ensure that ten rack-mount screws appropriate in size for your rack are immediately available. (Typically #10-32, or #10-24. Check your rack for proper screw size.)
2. The ORCA 21-slot chassis is shipped with its rack mount ears positioned for front (flush) mounting. To center mount the chassis, use a #2 Phillips screwdriver to remove the seven #10-32 screws affixing each rack mount ear. Reposition the rack mount ears to the center mount position. Replace all screws.
3. Lift the chassis and position it in the rack. The rack has keyhole cutouts for ease of installation. Ensure that all

holes in the mounting ears align with holes in the rack. Quickly install one screw in the top corner of each side using an appropriate tool. Allow the installed screws to support the weight of the chassis while installing the remaining eight screws.

Note

All ten screws must be installed.

For racks with equipment shelves installed, lift the ORCA 21-slot chassis and position it on the shelf. Install the ten mounting screws.

Power Module Installation

Once the chassis is mounted in the rack, you must install the power module into the chassis.

Caution

1. Installation must be performed by a qualified service person skilled in the installation and connection of power distribution systems, and is knowledgeable of applicable municipal electrical code requirements.

2. Before initiating this procedure, ensure that the main power cord(s) or cable(s) are not connected to the main power source and cannot carry a voltage potential until after this procedure is complete.

Caution

Electric shock risk may exist at the rear of the power bay. Do not touch or otherwise service this area unless all AC or DC power mains input voltages have been removed from the chassis.

The ORCA 21-slot chassis is shipped with two individually packaged power supply modules. Each power module weighs approximately 20 lbs (9kg).

Each ORCA 21-slot gateway power module is equipped with a spring-loaded, locking handle, which locks the module in position and releases the module from a locked position (see Figure 14).

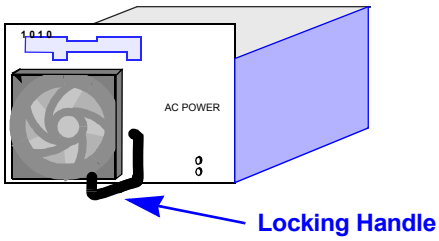


Figure 14. ORCA Gateway Power Module

1. Remove the blank support panel from the ORCA gateway chassis which is attached by eight screws. Reserve two screws if installing two power modules; reserve five screws if installing a single power module.
2. Remove the power modules from their packaging. **Ensure that the power switches on the ORCA gateway chassis are in the "0" (Off) position.** If the power switch is not in the off position, the power supply breaker may be damaged during the installation.
3. Align a power module in its upright position into the guide rails in an available power module bay. Slide the power module inward halfway as shown in Figure 15 on page 73.

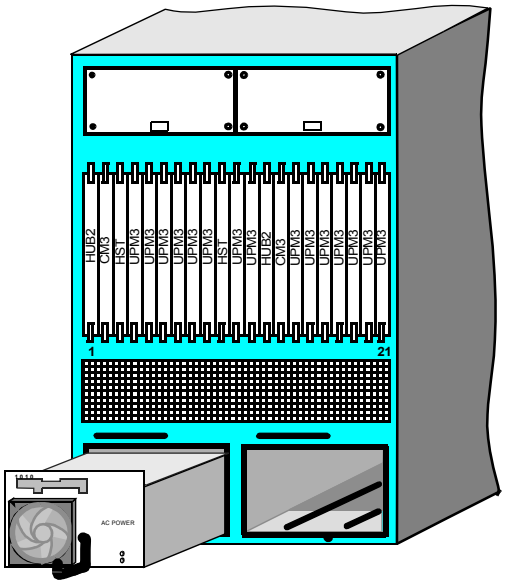


Figure 15. Power Module Installation

4. Disengage the spring-loaded locking handle by pushing the top of the handle vertically downward to release the locking mechanism. Rotate the handle outward, releasing the power module locking mechanism as shown in Figure 16.

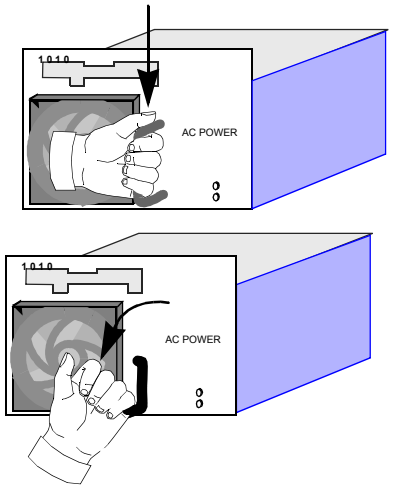


Figure 16. Power Module Locking Handle

5. With its locking handle disengaged, slide the power module inward to engage its rear guide pins.
6. Engage the locking handle.

7. Use a #2 Phillips screwdriver to install a screw previously saved from the support panel removal (Step 1) into the bottom center of the power module's front panel.

Caution

The anchor screw at the base of the power module front panel must be installed to inhibit non-service personnel from gaining access to the power bay.

8. Repeat this procedure for the second power module. If you are not installing a second power module, cover the opening of the second power bay with the power supply cover plate provided. Mount the cover plate using four previously-saved screws (Step 1).

Connecting Main Power

The ORCA 21-slot gateway is configured for either DC power or AC power. Equipment sites must provide two independently fault current protected -48 VDC power feeds, or two independently fault current protected 110/220 VAC power feeds, or one of each. DC power feeds should be fault current protected at 30 Amps. AC feeds should be fault current protected at 15 Amps.

Caution

1. Installation must be performed by a qualified service person who is skilled in the installation and connection of power distribution systems, and is knowledgeable of applicable municipal electrical code requirements.

2. If the ORCA 21-slot gateway is to be configured for two redundant DC power modules, the installation site should provide two independent -48 VDC power mains circuits to provide redundancy in the power mains source. Should one -48VDC power mains circuit fail, the other circuit and its associated power module will continue to provide power to the ORCA gateway.

Grounding the ORCA 21-Slot Chassis

Caution

Before connecting the AC or DC power mains, a separate ground strap (which is connected to a centralized ground network in the installation site) must be connected to the ground terminals at the rear of the power shelf assembly. The strap used for this purpose must be 10 AWG in size or larger. A dual 1/4" hole ring lug must be securely crimped to the end of the wire that connects to the ORCA gateway ground terminal.

1. Place the two-hole ring lug of the ground strap over the threaded studs of the ground terminal.
2. Fasten a 1/4" lock washer and a 1/4"-20 nut on each threaded stud. Tighten each nut to a torque of 6 ft/lbs (0.83 kg/m). See Figure 17.

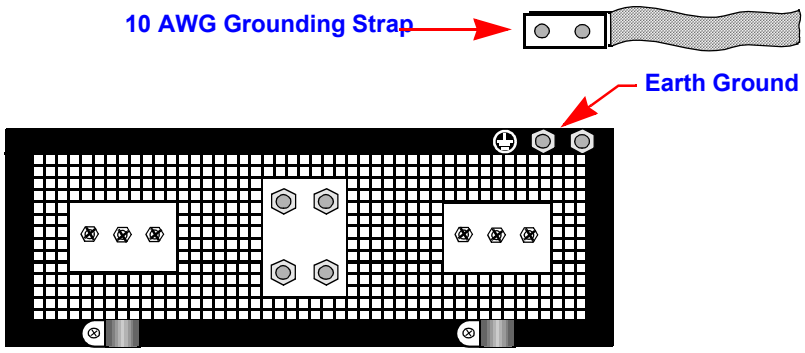


Figure 17. ORCA 21-Slot Chassis Ground Terminal Posts

Connecting DC Power

Caution

The two-wire cable used for connecting the DC terminals at the rear of the ORCA chassis must be of type STO (or equivalent) and 10 AWG in size or larger. Ring terminal lugs 1/4" ID in size must be securely attached to the ends of the wires that attach to the DC terminals.

1. Use a #2 Phillips to remove the four screws affixing the DC terminal cover. Remove the terminal cover to allow access to terminal posts. (See Figure 18).

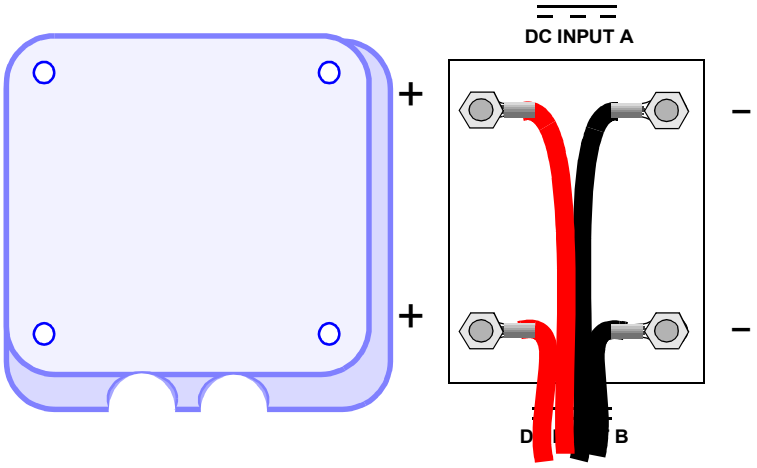


Figure 18. ORCA 21-Slot Gateway DC Power Terminal Posts

2. From a fault current protected –48VDC power feed, run an appropriate length of insulated color-coded 10 AWG (minimum) stranded cable for –48V, and –48V return to the ORCA gateway. Use cable run and bend radius information gathered during the site survey.

Caution

Before initiating this procedure, ensure that the main power cord(s) or cable(s) are not connected to the main power source and cannot carry a voltage potential until after this procedure is complete.

3. Make power connections at the rear of the ORCA gateway chassis. Terminate each power cable with a 1/4" x 10 AWG crimp-on solder-less lug-type connector. Allow no frayed ends or exposed uninsulated wire. See Figure 19.

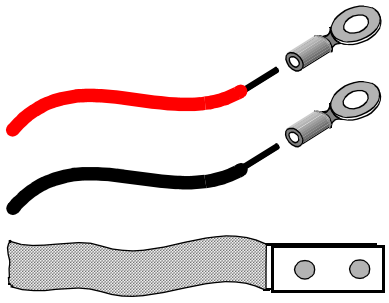


Figure 19. ORCA DC Power Cabling

4. Two pairs of threaded studs are provided at the DC terminal block. Each set is labeled + and – as shown in Figure 18 on page 76. The DC power mains wire providing –48VDC must be attached to the stud labeled – and the wire providing the return for –48VDC must be attached to the stud labeled +.

   The 1/4" ring lug on each wire must be securely attached to the associated DC terminal stud with a 1/4" lock washer and a 1/4"-20 nut. Tighten each nut to a torque of 6 ft/lbs (0.83 Kg/M).

5. Use a #2 Phillips screw driver to remove the strain relief clamp located along the bottom of the unit by removing its mounting screw (See Figure 20). Spread and place the strain relief clamp over each cable.

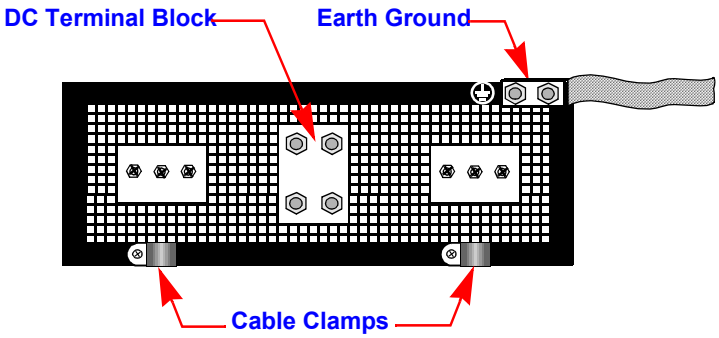


Figure 20. Fastening Cable Clamps

6. Use a #2 Phillips screw driver to reattach the strain relief clamps. Reposition the cable clamps and cables on chassis as necessary for optimal cable routing.

7. Use a #2 Phillips screw driver to replace the terminal cover.

Connecting AC Power

Caution

1. Installation must be performed by a qualified service person who is skilled in the installation and connection of power distribution systems, and is knowledgeable of applicable municipal electrical code requirements.

2. If the ORCA 21-slot chassis is to be configured for two redundant power modules, the installation site should provide two independent AC power mains circuits to provide redundancy in the power mains source. Should one AC power mains circuit fail, the other circuit and its associated power module will continue to provide power to the ORCA gateway.

3. For US/Canada installations, when connecting an ORCA gateway to a 100–127VAC service, use Nuera cable assembly 249-025 or equivalent. When connecting an ORCA gateway to a 220–250VAC service, use Nuera cable assembly 504-167 or equivalent.

4. For installations in the United Kingdom, use the 504-153 BS 1363 plug power cord (13A/250VAC); for all other international installations, use the 504-154 CEE 7/7 "Schuko" power cord (16A/220-230VAC) or the 504-159 unterminated power cord.

5. Use only single-phase, line-to-neutral AC voltage for power input.

Power Cable Requirements

The three-wire cable used for connection to the AC terminals at the rear of the ORCA 21-slot chassis (see Figure 21) must be:

- Type STO
- 14 AWG

- Less than 14.75 feet (4.5 meters)

Ring terminal studs (14 AWG x #10) must be securely attached to the ends of the wires that are used to connect to the AC terminal block.

For US/Canada installations, use connector type NEMA 5-15P for 100–120VAC applications, or connector type NEMA L6-30 for 220–250VAC applications.

For international installations, power cables are not supplied with connectors. Power connectors must be provided by the installation site, or the international power cable must be hard-wired to a junction box.

The wire used must be color coded and connected as shown in Table 3.

Table 3. Power Cable Color Codes

AC Terminal	US/Canada	International
Line	Black	Brown
Neutral	White	Blue
Ground	Green/yellow or Green	Green/yellow

1. Use a #2 Phillips screwdriver to remove the mounting screws affixing the AC terminal cover. Remove the terminal cover to allow access to screw terminals. See Figure 21.

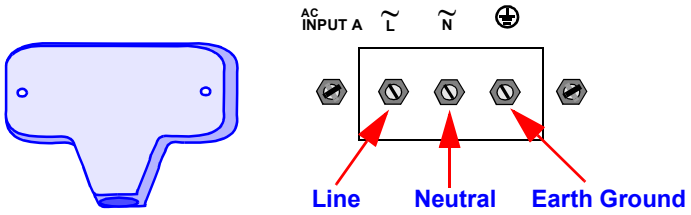


Figure 21. AC Terminal Block

2. Use a #2 Phillips screw driver to remove the strain relief clamp directly under the AC terminal by removing its mounting screw.

3. From an AC power mains source, run an appropriate length of color-coded AWG 14 stranded cable for earth ground, AC line (L), and neutral (N) to the ORCA chassis. Use cable run and bend radius information gathered during the site survey.

Caution

1. Before initiating this procedure, ensure that the main power cord(s) or cable(s) are not connected to the main power source and cannot carry a voltage potential until after this procedure is complete.

2. The ground wire of the AC cable should be attached first to the terminal marked with this international ground symbol.

4. The contacts on the AC terminal block are labeled L, N, and the international ground symbol. Insert the screw provided through the ring lug of the ground wire of the AC cable. Use a flat blade screw driver to attach the screw to the terminal of the AC terminal block labeled with an international ground symbol.
5. Connect the terminal lugs to the AC power connectors and firmly tighten screws. The power cables should be anchored at regular lengths of 6 inches. See Figure 22.

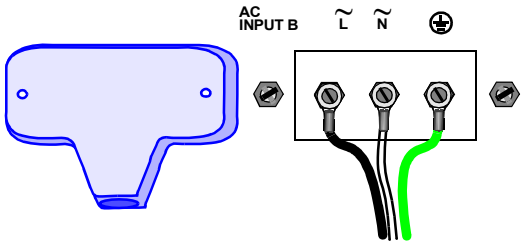


Figure 22. AC Screw Terminals

6. Spread and place the strain relief clamp over each cable. Use a #2 Phillips screw driver to reattach the strain relief clamps. Reposition the cable clamps and cables on chassis as necessary for optimal cable routing.
7. Replace the AC terminal cover and tighten mounting screws.

Custom Length AC Power Cables

Should the power cables available from Nuera be of inappropriate length for your installation, use the following information to construct a power cable of custom length. Observe the requirements listed in “Power Cable Requirements” on page 78.

Caution

1. Installation must be performed by a qualified service person skilled in the installation and connection of power distribution systems to ORCA-class equipment who is knowledgeable of applicable municipal electrical code requirements.

2. Before initiating this procedure, ensure that the main power cord(s) or cable(s) are not connected to the main power source and cannot carry a voltage potential until after this procedure is complete.

1. From an AC power mains source, run an appropriate length and gauge of color-coded AWG stranded cable for earth ground, AC line (L), and neutral (N) to the ORCA gateway. Use cable run and bend radius information gathered during the site survey.
2. Make power connections at the rear of the ORCA chassis. Terminate each power cable with a crimp-on solderless lug-type connector. Allow no frayed ends or exposed uninsulated wire. See Figure 23.

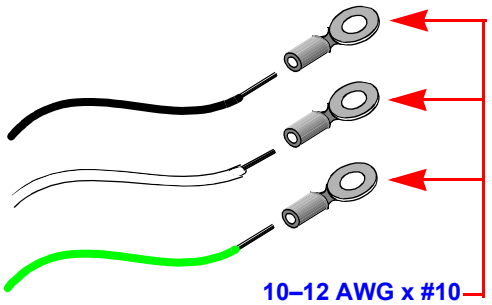


Figure 23. Attaching Terminal Lugs

Applying Power

Caution

Power should only be applied to the ORCA gateway after a thorough inspection of all connections made. Allow no frayed ends or exposed uninsulated wire. Ensure that the ORCA gateway power switches are in the Off (0) position.

Energize the DC or AC power mains by moving the respective circuit breaker actuators to their On (1) position.

Apply power to the ORCA 21-slot gateway by moving power switches for both power modules to their On (1) position. Observe that the ORCA gateway's fan modules and power modules indicate green LEDs. The ORCA gateway's power-on self-test (POST) initiates. See Figure 24 on page 82.

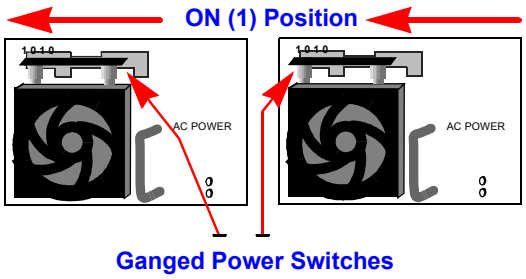


Figure 24. Applying Power

Power-On Self-Test

The ORCA 21-slot gateway's power-on self-test is a ROM-based program that ensures proper initialization of the gateway. Status indicating LEDs present on each system module transition in sequence from blue, blinking yellow (Power On Self Test), to green (online).

If a slot configuration exists for each installed module, the module is programmed automatically. Use the ORCA NMS (either NueraView for ORCA or the Configurator) to configure the slot and place the module online. See the online help for information.

Signal Cables

ORCA cables are optionally provided with the ORCA gateway. Connector types vary depending on the ORCA gateway configuration and existing ancillary equipment types.

ORCA 21-slot gateway connector types include DB-9M, DB-15F, DB-25M, BNC, and RJ-45F connectors.

Ancillary equipment connector types can vary with the application. Use cables with appropriate connector types to suit required interface types. For specific information about available ORCA gateway cables, see "Cables and Connectors" on page 165.

All gateway signal cables connect at the rear of the ORCA chassis. Use cable run and bend radius information gathered during the site survey to run appropriate lengths of signal cables between the ORCA gateway and ancillary equipment. Be sure to fasten cable anchor screws and clamps.

Connecting the HSTX Bridge Card Cables

The HSTX Bridge card consists of twelve BNC connectors to terminate up to three DS3 circuits. The center column of the BNC connector array terminates coaxial cables connecting the gateway to the carrier demarcation point. Each DS3 circuit requires two coaxial cables: one to transmit, and one to receive.

Passive electronic components of the HSTX/Bridge split the DS3 circuits to the outer two columns of BNC connectors.

The outer two columns of BNC connectors are then connected to the HSTX cards via coaxial cables as shown below in Figure 25.

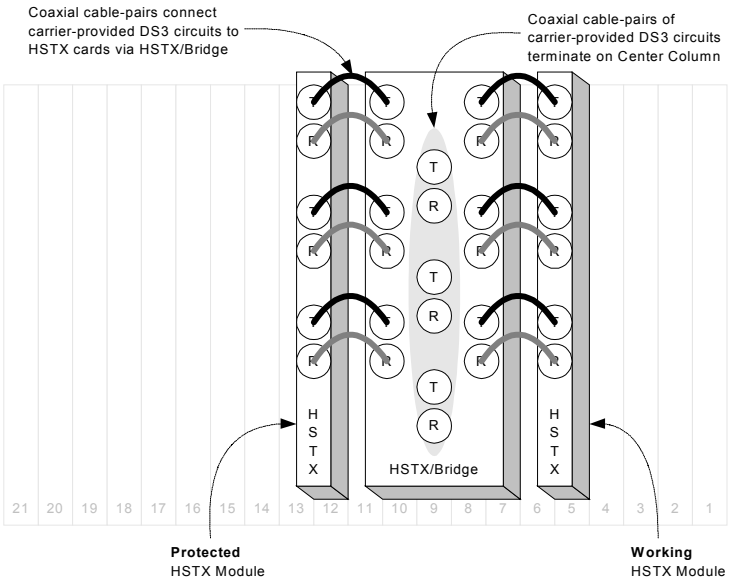

Coaxial cable-pairs connect carrier-provided DS3 circuits to HSTX cards via HSTX/Bridge
Coaxial cable-pairs of carrier-provided DS3 circuits terminate on Center Column
T
R
T
R
T
R
H S T X
HSTX/Bridge
H S T X
21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
Protected HSTX Module
Working HSTX Module

Figure 25. The Bridge Card Connected to the Protected (standby) and Working (active) HSTX Modules.

Connect twelve coaxial cables from the Bridge to the HSTX modules. Make sure to match up transmit (Tx) and receive (Rx) connectors on the Bridge module to the Tx and Rx connectors on the HSTX modules.

5

Installing the ORCA 8-Slot Chassis

An ORCA gateway ships with all of its cards installed, making on-site hardware installation a simple process. The hardware installation section contains a list of necessary equipment and step by step instructions.

Nuera provides a sophisticated graphical user interface (GUI) for all system configuration, monitoring, and troubleshooting. These functions are performed by one of two solutions: ORCA Configurator or NueraView for ORCA. See the software manual (e.g., GX or RDT) for more information.

Before You Start

Tools

Depending on the type of installation, you may require the following tools:

- Punch tool
- Digital meter
- Telephone test set
- A set of hand tools (such as cordless screwdriver, #2

Phillips screwdriver, 5/16" flat blade screwdriver, SAE wrenches)

- Standard crimper tool
- Transmission test set (E-1/T-1 applications)

Unpacking the 8-Slot Chassis

The ORCA 8-slot gateway is shipped with all required accessories. The contents include:

- Pre-assembled ORCA 8-slot chassis (with card modules, fans, and power supplies installed)
- Front panel
- Connecting cables (optional)
- ORCA software and documentation

Opening the Carton

See Figure 26 for shipping carton contents.

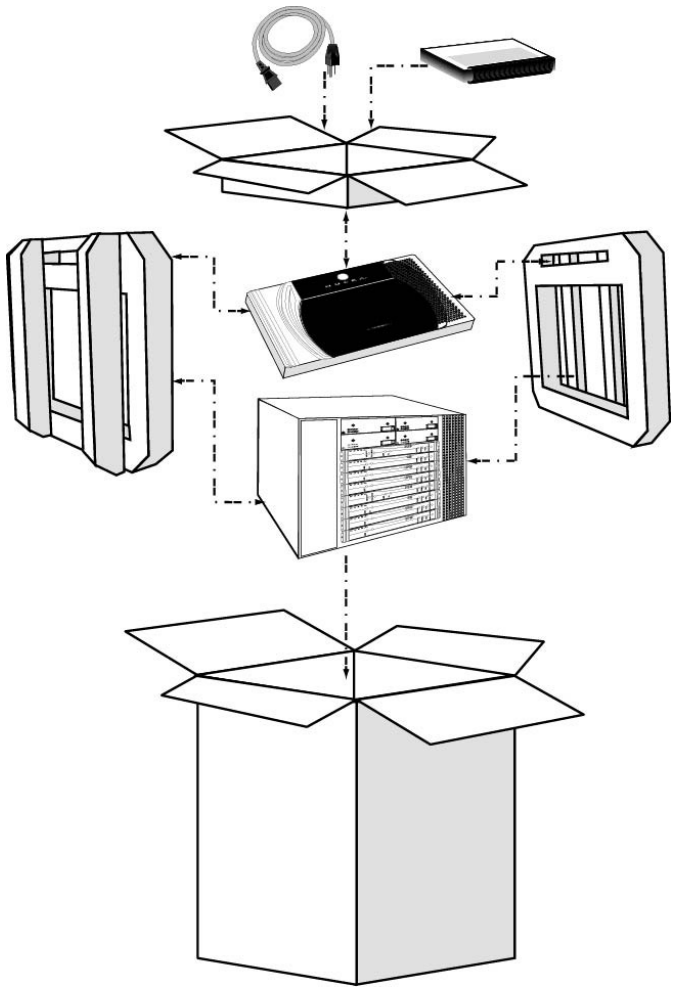


Figure 26. ORCA 8-Slot Gateway Shipping Carton and Contents

Prior to unpacking, ensure that the shipping carton is in its upright position to avoid damaging the unit.

Installing the ORCA Chassis

The ORCA 8-slot chassis is shipped with system front and rear card modules, fan trays, and power supply modules

installed. It is positioned within the shipping carton in its upright position. See Figure 27.

Figure 27. ORCA 8-Slot Chassis

Caution

The ORCA 8-slot chassis with power modules installed weighs approximately 45.3 lbs (20.55 kg). Ensure that adequate manpower is available before attempting to remove the chassis from its shipping container.

The gateway is intended only for installation in a restricted access location. The recommended maximum operating temperature is 50 C. When installing the chassis in a multi-unit rack assembly or in proximity to other operating equipment, measures should be taken to ensure that the maximum operating temperature of the gateway is not exceeded. Likewise, measure should be taken to ensure that airflow is not compromised.

3. Remove the 8-slot chassis from its shipping container.
4. The 8-slot chassis is shipped with its rack-mount ears positioned for front (flush) mounting. To center mount the chassis, use a #2 Phillips screwdriver to remove the five #6-32 screws affixing each rack-mount ear. Reposition the rack-mount ears to the center mount position. Replace all screws. Take care that the rack is correctly mounted, so that a hazardous condition is not created due to an uneven mechanical load.
5. Ensure that eight rack-mount screws appropriate in size for your rack are immediately available. (Typically #10-32, or #10-24. Check your rack for proper screw size.)

6. Lift the chassis and position it in the rack. Ensure that all holes in the mounting ears align with holes in the rack. Install one screw in the bottom corner of each side using an appropriate tool. Allow the installed screws to support the weight of the chassis while installing the remaining six screws.

Note

All eight screws must be installed.

For racks with equipment shelves installed, lift the 8-slot chassis and position it on the shelf. Install the eight mounting screws.

Remember to check the nameplate rating to ensure that there is no overloading of the supply circuits. Also, reliable earthing of rack-mounted equipment should be maintained. Supply connections other than direct connections to the branch circuit should be given careful attention.

Connecting Main Power

8-slot gateways are configured for either DC or AC power. If the gateway is redundant, both power supply pairs are designed to accept separate power feeds. ORCA sites must provide either two independently fault current protected -48 VDC power feeds or two independently fault current protected 110–240 VAC power feeds. DC power feeds should be fault current protected at 15 Amps. AC feeds should be fault current protected at 7 Amps minimum.

Grounding the ORCA Unit

Caution

Installation must be performed by a qualified service person who is skilled in the installation and connection of power distribution systems to ORCA-class equipment and is knowl-

edgeable of applicable municipal electrical code requirements.

Caution

Before connecting the AC or DC power mains, a separate ground strap (which is connected to a centralized ground network in the installation site) must be connected to the ground terminals at the rear of the 8-slot unit. The strap used for this purpose must be 10 AWG in size or larger. A dual #10 hole ring lug must be securely crimped to the end of the wire that connects to the gateway ground terminal.

1. Place the two-hole ring lug of the ground strap over the threaded studs of the ground terminal.
2. Fasten a #10 lock washer and a 10-32 nut on each threaded stud. Tighten each nut to a torque of 29.7 in/lbs (0.34 kg/m). See Figure 28.

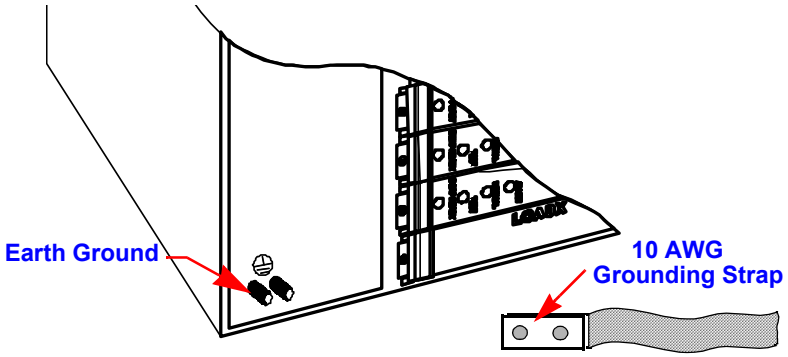


Figure 28. 8-Slot Ground Terminal Posts

DC Power Cable Requirements

The cable pair used for connecting the DC terminals at the rear of the 8-slot chassis must be:

- Type STO wire
- minimum size 26 AWG
- Supplied with #8 ring terminal lugs for terminal connection
- Connected to a fault current protected 48VDC power feed.

The 8-slot gateway should be installed with a listed fuse rated with a minimum of 60 V, and a maximum of 15 A. The DC supply source should be electrically isolated from any AC sources, and must have a reliable ground connection.

Connecting DC Power

Caution

Installation must be performed by a qualified service person skilled in the installation and connection of power distribution systems to ORCA class equipment who is knowledgeable of applicable municipal electrical code requirements.

Caution

The ground strap of the gateway should be attached first to the terminal marked with this international ground symbol.

Caution

Before initiating this procedure, ensure that the main power cord(s) or cable(s) are not connected to the main power source and cannot carry a voltage potential until after this procedure is complete.

Caution

If the ORCA unit is to be configured for two redundant pairs of power modules, the installation site should provide two independent DC power mains circuits to provide redundancy in the power mains source. Should one DC power mains circuit fail, the other circuit and its associated power module will continue to provide power to the 8-slot unit.

1. Remove the DC terminal block cover from the gateway's DC input terminal block A/B to allow access to the #8 screw terminals.
2. Connect the positive side of the 48VDC power feed to the screw terminal labeled "BAT RTN (+)", and the negative side to the terminal labeled "-48VDC (–)". Ring terminal

lugs are recommended to ensure a secure connection. Allow no frayed ends or exposed uninsulated wire. See Figure 29.

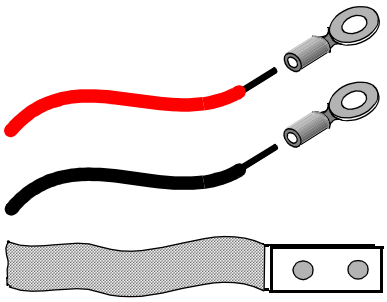


Figure 29. DC Power Connectors

3. Replace the DC terminal block cover to prevent accidental contact with the terminal screws.
4. Repeat the above procedure for terminal block C/D if redundant power supplies are being utilized.
5. A pair of cable clamps are provided to facilitate strain relief of the power cables and to position the cables in a less intrusive location. Use a #2 Phillips screw driver to remove the strain relief clamps to the left of the DC connectors by removing their mounting screws.
6. Spread and place the strain relief clamp over each cable.
7. Reattach the strain relief clamps. Reposition the cable clamps and cables on chassis as necessary for optimal cable routing as shown in Figure 30.

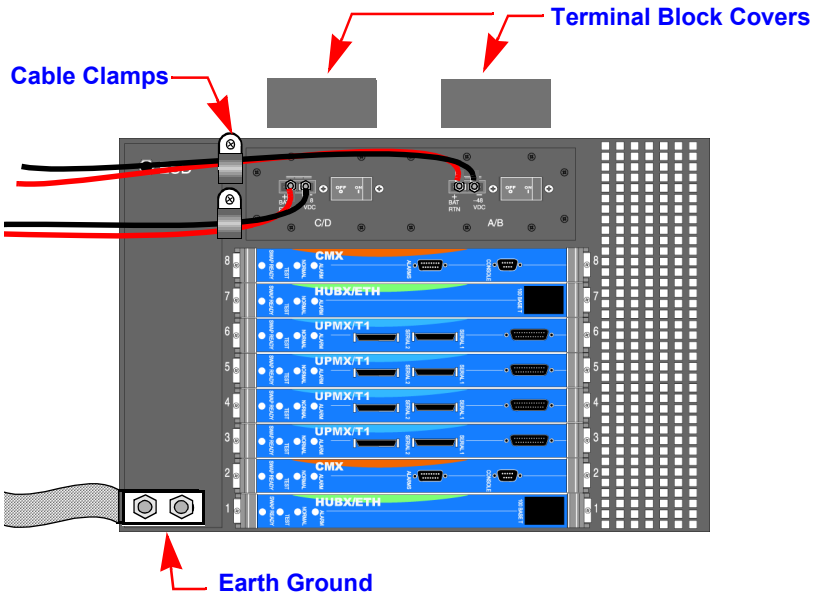


Figure 30. Connecting DC Power

AC Power Cable Options

The AC power cables used for connection to the 8-slot chassis (see Figure 31 on page 95) are available as shown in Table 4 on page 94.

Table 4. AC Power Cable Options

Nuera P/N	Plug Type	Country
249-005	CEE 7/7 “Schuko”	Western Europe
249-006	BS1362	UK
249-008	AC3112	Australia
249-024	NEMA5-15P	US/Canada

Connecting AC Power

Caution

Installation must be performed by a qualified service person skilled in the installation and connection of power distribution systems to ORCA class equipment who is knowledgeable of applicable municipal electrical code requirements.

Caution

The ground strap of the gateway should be attached first to the terminal marked with this international ground symbol.

Caution

Before initiating this procedure, ensure that the main power cord(s) or cable(s) are not connected to the main power source and cannot carry a voltage potential until after this procedure is complete.

Caution

If the 8-slot gateway is to be configured for two (redundant) pairs of power modules, the installation site should provide two independent AC power mains circuits to provide redundancy in the power mains source. Should one AC power mains circuit fail, the other circuit and its associated power module will continue to provide power to the ORCA unit.

1. Use a #2 Phillips screw driver to remove the strain relief clamps to the left of the AC connectors by removing their mounting screws. See Figure 31 on page 95.

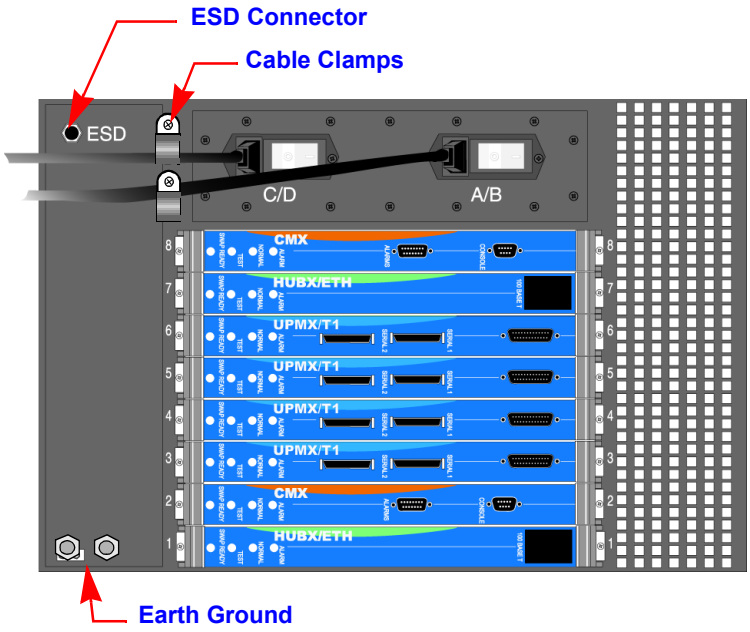


Figure 31. AC Power Connections

Caution

Before initiating this procedure, ensure that the main power cord(s) or cable(s) are not connected to the main power source and cannot carry a voltage potential until after this procedure is complete.

Caution

The ground strap of the gateway should be attached first to the terminal marked with this international ground symbol.

2. Spread and place the strain relief clamp over each cable.
3. Firmly insert both AC power cables into their respective receptacles on the back panel of the 8-slot chassis.
4. Use a #2 Phillips screw driver to reattach the strain relief clamps. Reposition the cable clamps and cables on chassis as necessary for optimal cable routing. See Figure 32 on page 96.

.

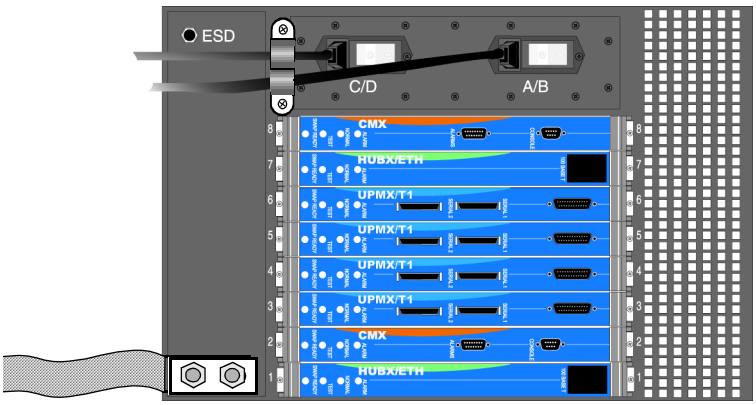


Figure 32. Connecting AC Power

Signal Cables

Caution

To ensure compliance to electro-magnetic interference (EMI) standards, signal cables should implement two layers of cable shielding (foil and braid) with 360 degree contact to connectors.

ORCA cables are optionally provided with the gateways. Connector types vary depending on gateway configuration and existing ancillary equipment types.

Gateway system-module connector types include DB9(M), DB15(F), DB25(M), DB26(F), and RJ45(F) connectors.

Ancillary equipment connector types can vary with the ORCA site. Use cables with appropriate connector types to suit required interface types. For specific information about available ORCA cables, see "Cables and Connectors" on page 165.

All ORCA signal cables connect at the rear of the chassis. Use cable run and bend radius information gathered during the site survey to run appropriate lengths of signal cables between the gateway and ancillary equipment. Be sure to fasten cable anchor screws and clamps.

Applying Power

Caution

Power should only be applied to the gateway after a thorough inspection of all connections made. Allow no frayed ends or exposed uninsulated wire. Ensure that the ORCA unit power switches are in the Off (0) position.

Energize the ORCA site DC or AC power mains by moving the respective circuit breaker actuators to their On (1) position.

Apply power to the 8-slot chassis by moving power switches for both power module pairs to their On (1) position. Observe that the chassis fans, power supplies, and circuit card modules indicate green LEDs. The gateway's power-on self-test (POST) initiates. See Figure 33.

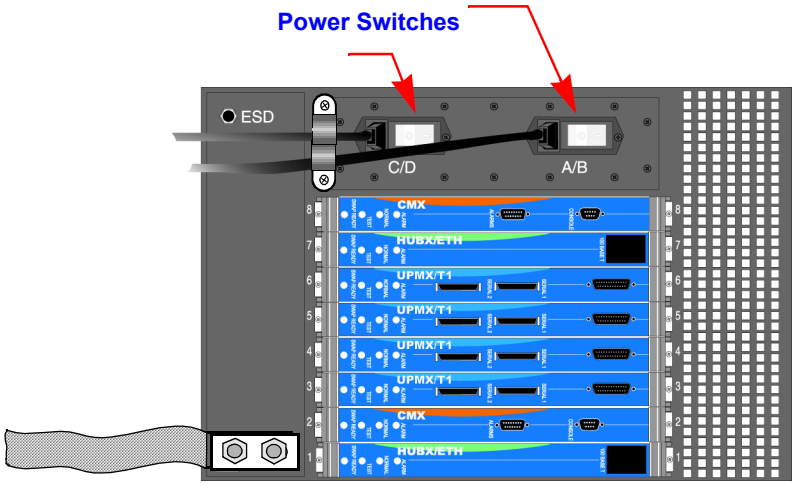


Figure 33. Applying Power

Power-On Self-Test

The 8-slot gateway's power-on self-test is a ROM-based program that ensures proper initialization of the gateway. Status indicating LEDs present on each system module transition in sequence from blue, blinking yellow (Power On Self Test), to green (online).

If a slot configuration exists for each installed module, the module is programmed automatically. Use the Nuera Configurator or NueraView to configure the slot and place the module online.

Signal Cables

ORCA cables are optionally provided with the ORCA gateway. Connector types vary depending on the ORCA gateway configuration and existing ancillary equipment types.

ORCA 21-slot gateway connector types include DB-9M, DB-15F, DB-25M, and RJ-45F connectors.

Ancillary equipment connector types can vary with the application. Use cables with appropriate connector types to suit required interface types. For specific information about available ORCA gateway cables, see "Cables and Connectors" on page 165.

All gateway signal cables connect at the rear of the ORCA chassis. Use cable run and bend radius information gathered during the site survey to run appropriate lengths of signal cables between the ORCA gateway and ancillary equipment. Be sure to fasten cable anchor screws and clamps.

6

CONFIGURATION

This chapter describes the configuration functions performed through the ORCA gateway's console port. It also provides specific instructions for configuring a gateway using console port commands.

The Console Port

The console part plays a small yet crucial part of bringing an ORCA gateway online in a network. The port is located on the CMX card. It is a DB9 (M) serial port, and is intended to connect a computer directly into the gateway to assign basic configuration information.

Once a computer has been connected to the port, a terminal emulation program, such as Procomm Plus™, should be used to access the gateway. Use the settings below to correctly configure the emulation program:

- 9600 bps (ANSI ASCII format)
- Parity: None
- Bits: 8
- Stop bits: 1

The following network settings must be configured or the gateway will not function:

- ethernet subnet mask
- default network gateway
- ethernet IP address.

Configuring these settings, specifically the IP address, will trigger the storage initialization process, which requires the gateway to be power-cycled. When the gateway comes back on-line, the new settings will be intact.

See “Ethernet Commands” on page 105 for more information on how to configure these settings.

Console Port Commands

This section presents the complete list of ORCA gateway commands that you can enter through the unit’s console port. These console port commands serve to configure the gateway initially. Once the ORCA gateway is functional, the remainder of the configuration is performed through either the ORCA Configurator or a SNMP network management system (like NueraView).

SNMP Community String Commands

SNMP **`community strings`** allows you to set low-level security for an ORCA gateway. With community strings, you can assign names to all your ORCA gateways. That name will be embedded in every header packet the gateway sends out. When an ORCA gateway and the Nuera PC workstation have community strings enabled, they will both embed the same name in their messages, and will verify the name in the header, throwing away any packets from nodes that do not contain the configured community string. The community string setting defaults to **`public`**. If this default setting is changed using the console port commands, the corresponding community string pop-up in NueraView needs to be altered to match.

`MANAGER COMMUNITY SHOW`

Displays the current community string name listed for the ORCA gateway.

`MANAGER COMMUNITY WRITE`

This command is applicable to the RDT and BTX-Series gateways. The gateways support community strings using the following parameters: ***`<INDEX> <PRIVILEGES> <STRING>`***. After entering the command, a prompt appears to enter the parameters.

Parameters

`<INDEX>`

Specifies one of five community strings where **<*INDEX*>** is 1,2,3, 4 or 5.

<*PRIVILEGES*>

This parameter is used to grant read-only, or read-write privileges to the gateway accessed by the specified community string. Specify **r** or **rw**.

<*STRING*>

Specifies the designation you wish the ORCA RDT gateway to be identified by. Specify a string of up to 32 alphanumeric characters.

MANAGER MODE <*UNIVERSAL/INDIVIDUAL*>

This command is applicable to the BTX-Series gateways. The BTX allows the manager mode to be set from the console port in case of accidental lockout. See the Software Manual for more information about Managers.

MANAGER MODE SHOW

This command is applicable to the BTX-Series gateways. The BTX allows the manager mode to be set from the console port in case of accidental lockout. This command shows the current mode of the agent. See the Software Manual for more information about Managers.

SNMP Configuration Commands

The **snmpcfg** command sets certain SMNP configuration parameters in the gateway. These commands are applicable to the BTX-Series gateways.

.

SNMPCFG <V3TRAPS|V2TRAPS>

Set the gateway to send traps in SNMPv3 or SNMPv2 format.

.

SNMPCFG PROCV2 <ON|OFF>

Set the gateway to process or stop processing SNMPv2 packets.

.

SNMPCFG PASSPHRASE RESET

Sets the SNMP Configurator password to the default of: **authpriv**.

.

SNMPCFG HELP

This command will display all the SNMP configuration options.

Packet Sniffing Debug Commands

The **debug** command sets up the ORCA gateway to send debug strings to a remote host. The remote host needs to be running a packet-sniffing program to read and log the messages. This command is intended to be used for debugging and troubleshooting purposes.

DEBUG OUTPUT <SYSTEM|CARD> <*IPADDR*> MASK FFFFFFFF

The **debug output** command configures the gateway to start sending the debug messages. The **debug output** command must be used with the **mask** option. **Mask** refers to bitmap masking. It is recommended to use the **FFFFFFFF** masking definition. This option will send all generated debug messages to the remote packet sniffer.

Parameter

<SYSTEM|CARD>

Choose between the **system** and **card** operands. Select **system** if you wish to see the debug messages sent from the CM card and all the UPM3 cards in the box. Select **card** if you wish to see the debug messages sent from the CM card only. To see messages from the secondary CM card, you must plug into the console port on the secondary card and use the **debug output** command to configure that card separately.

<IPADDR>

Specify the decimal IP address of the remote system that runs the packet sniffer. For example, **120.43.254.2**. This address is assigned locally by your network administrator. Use UDP port 1301 for all debugging traffic.

DEBUG SHOW

The **debug show** command lists the current **debug** settings on the gateway.

Ethernet Commands

The **ethernet** command group provides LAN configuration parameters for the ORCA gateway. There are four ethernet commands:

- **ethernet default**,
- **ethernet ip**,
- **ethernet mask**, and
- **ethernet show**.

ETHERNET DEFAULT <1|2|3|4> <*IPADDR*>

Sets the IP address of the ORCA gateway or router that the ORCA chassis uses as a default gateway. When the unit sends IP messages to a destination that is not on its subnet, these messages are directed to the gateway device for forwarding to the appropriate network.

Parameters

<1|2|3|4>

Specify the default gateway device. Multiple default gateways are not currently supported; therefore, you must specify 1.

<IPADDR>

Specifies the decimal IP address of the gateway device. For example, **120.43.254.2**. This address is assigned locally by your network administrator.

ETHERNET IP <*IPADDR*>

Sets the IP address of the active control module (CM) in an ORCA gateway.

Parameter

<IPADDR>

Specifies the decimal IP address of the ORCA gateway. For example, **120.43.254.2**. This address is assigned locally by your network administrator.

ETHERNET MASK *<IPMASK>*

Sets the identifier for a network subnet, which shares a network address with other portions of the network and is distinguished by a subnet number. The subnet may be a physically independent network.

Parameter

<IPMASK>

Specifies the ORCA gateway's internet subnet mask number. This address is assigned locally by your network administrator. For example, **255.255.255.0**.

ETHERNET SHOW

Displays the current ethernet settings for the ORCA gateway.

Note

The active CM's IP address, the subnet mask, and the default gateway can all be viewed from the NMS, but can only be changed from the console. During installation, set these parameters from the console before contacting the unit with NueraView.

Help Command

The **help** command displays a list of all available ORCA gateway console port commands. See Figure 34.

```
HELP OR ?
```

```
ETHERNET DEFAULT {1|2|3|4} <xxx.xxx.xxx.xxx> (decimal)
ETHERNET IP <xxx.xxx.xxx.xxx> (decimal)
ETHERNET MASK <xxx.xxx.xxx.xxx> (decimal)
ETHERNET SHOW
HELP
PSW <password>
QUIT
VERSION
```

Figure 34. Help Command Display

Route Command

This command is applicable to the RDT-Series gateways. Use the route command to add and delete static routes to the gateway.

```
ROUTE ADD <NETWORK ADDR> <SUBNET MASK>
<GATEWAY|DIRECT>
```

<NETWORK ADDR>

The destination network address.

<SUBNET MASK>

The destination subnet mask.

<GATEWAY>

The IP address of router the RDT connects to.

DIRECT

Use direct if the RDT can reach the destination network by broadcasting directly out to the LAN.

ROUTE DELETE <*IPADDR*>

Deletes the route identified by the destination network address.

ROUTE SHOW

Lists all the configured static routes.

Syslog Command

This command is applicable to the RDT-Series gateways. Use this command to setup the syslog feature.

SYSLOG SET <*IPADDR*>

Set the IP address of the PC where the syslog server is installed.

SYSLOG DISABLE

This command disables the collection of information from the syslog server.

```
SYSLOG SHOW
```

Lists the IP address set as the syslog server address.

Password Command

Establishes a single-level security scheme for an ORCA gateway.

```
PSW <PASSWORD>
```

Parameter

<PASSWORD>

Specify a maximum of 30 alphanumeric characters.

Traceroute Command

This command is applicable to the RDT-Series gateways. Use this command to help configure your gateway.

```
TRACEROUTE <IPADDR> OR <HOSTNAME>
```

Use this command to see the number and name of all the hops (routers) it takes to get from the gateway to the entered IP address or hostname.

Ping Command

This command is applicable to the RDT-Series gateways. Use this command to help configure your gateway.

```
PING <IPADDR> OR <HOSTNAME>
```

Use this command to verify the existence of the entered IP address or hostname.

Quit Command

The **quit** command ends an ORCA gateway console session and returns the display to the **Enter Password** prompt. After a console session has been ended, a password must be entered to begin a new console session.

Always conclude a terminal session by executing the **quit** command. This prevents accidental or unauthorized use of a command that might disrupt communication or interrupt operation of the ORCA gateway.

```
QUIT
```

Shelf ID Show Command

The **shelfid show** command displays the current chassis ID and the slot that contains the active CM. For example, **Current: <shelf 17, slot e>**.

```
SHELFID SHOW
```

Storage Initialization Command

The **storage init** command deletes all configurational settings from the gateway and resets it with the factory default settings. After entering this command, you are prompted to confirm the action and wait approximately 30

seconds until another prompt appears, requesting you to power cycle the gateway.

Caution

You must not power cycle until prompted to do so. Power cycling too soon can result in an undefined configuration, which can cause irreparable damage to the gateway.

```
STORAGE INIT
```

Version Command

The **version** command displays the number and date of the Nuera ORCA release that is currently running on the control module (CM).

```
VERSION
```

Nuera Configurator and Nuera-View

Now that the basic configuration is finished, continuing configuration is done using the Nuera Configurator. Refer to the appropriate software manual to learn how to use the Configurator to configure and monitor an ORCA gateway.

7

ORCA Gateway Maintenance

This chapter presents maintenance procedures for the ORCA gateway and its components. All card assemblies, power modules, and fan modules, and software can be replaced on site, as explained in this chapter. In addition, the fan filters and power supplies require periodic cleaning. For service to other parts and chassis components, contact Nuera or your authorized service provider to have an ORCA gateway serviced properly.

Power Precautions

Caution

Electric Shock Hazard: *Before servicing an ORCA gateway, remove all connections to AC/DC power line and public telephone network lines. Contact the Nuera TAC or your authorized service provider if you have any questions regarding this procedure.*

When performing maintenance or repair procedures on an ORCA gateway that require accessing the internal assembly or cable ports, observe the following precautions to avoid possible injury:

- Always **unplug the AC power cord** and any connections to the public telephone network before removing the cover from an ORCA gateway.
- Be aware that certain power supply surfaces (including heat sinks) could be at a high voltage potential.

Caution

***Electrostatic Discharge**: When performing maintenance or repair procedures on an ORCA gateway, note that all of the internal assemblies and cable ports on the rear panel are susceptible to damage from Electrostatic Discharge (ESD). To reduce the possibility of damage to these devices, always observe standard ESD handling precautions, including (but not limited to) the following:*

- Avoid touching circuitry or conductive components of the gateway or its subassemblies.
- Place the gateway and all subassemblies on a grounded anti-static mat whenever maintenance is performed.
- Use an approved personal grounding device (such as a wrist strap) at all times when handling these products.
- Use only approved anti-static containers when shipping or moving any of these products.

Failure to observe these precautions could result in serious damage to these products with either immediate or latent operational failure or performance degradation. ESD-related failures due to improper handling may affect the coverage under your warranty.

Caution

***Proper Resistance**: To prevent rapid dissipation of any static charge and to protect service personnel from electric shock, a minimum of 1MΩ (Megohm) series resistance is required between service personnel and the ground connection. Many commercial products meet this requirement; any of these are acceptable. Please consult Nuera if additional information is required.*

Gateway Status

It is possible for all ORCA card modules to be removed and replaced without disconnecting power to the gateway.

Dual CM clusters are present in a chassis to guard against a service outage. Upon detection of a failed module in a control cluster, the UPM3/UPM4 and HST cards automatically switch to the backup control cluster.

Because each control cluster includes a HUB2 and a HUB2X card, the ORCA gateway provides dual 100Base-T buses to ensure redundancy in the event of a 100Base-T failure on the primary cluster's HUB2/HUB2X.

You can monitor module operation in three ways:

- ORCA network management system
- SNMP trap monitoring
- LED indicators

The first alternative requires the use of the Nuera Configurator, which is included with your gateway purchase. The second requires NueraView, a more advanced software tool. For more information on using either software package, refer to the software manual.

Card LED Indicators

This section describes the LED indicators that appear on ORCA gateway modules. For more information on ORCA alarm and status indicators, see the software manual.

All ORCA gateway modules (HUB2, HUB2X, CM, CMX, UPM3, UPM4, HST, and HSTX) have LEDs that signal the operational condition of the associated card. These LEDs

and their associated conditions are described in Table 5, “LEDs: All Cards,” on page 140.

Power Module LED Indicators

The ORCA power module provides two (one on the 8-slot chassis) front-panel status LEDs that indicate power input and output condition. A green output LED indicates that the power module output is in regulation. A red LED indicates a power supply malfunction. If neither LED is lit, the power module has lost connection to its main power feed.

Fan Module LED Indicators

ORCA fan modules are equipped with a front-panel, two-color LED status indicator. Normal function displays a green LED indication. A red LED indicates that the fan is not rotating. If neither LED is lit, the fan module has lost connection to the power supply rail.

Power Module Maintenance

21-Slot Chassis Power Modules

Two power modules are installed at the bottom of an ORCA 21-slot chassis (see Figure 35 on page 117). In normal operation, the power load is shared equally by both power modules. Each module is designed to individually sustain power to the ORCA gateway in case one power module fails.

Either module can be removed by switching module power Off, disengaging the locking handle, and pulling directly out from the front of the 21-slot chassis. As a safety precaution, the locking handle is designed to force the module power switch to its Off (0) position.

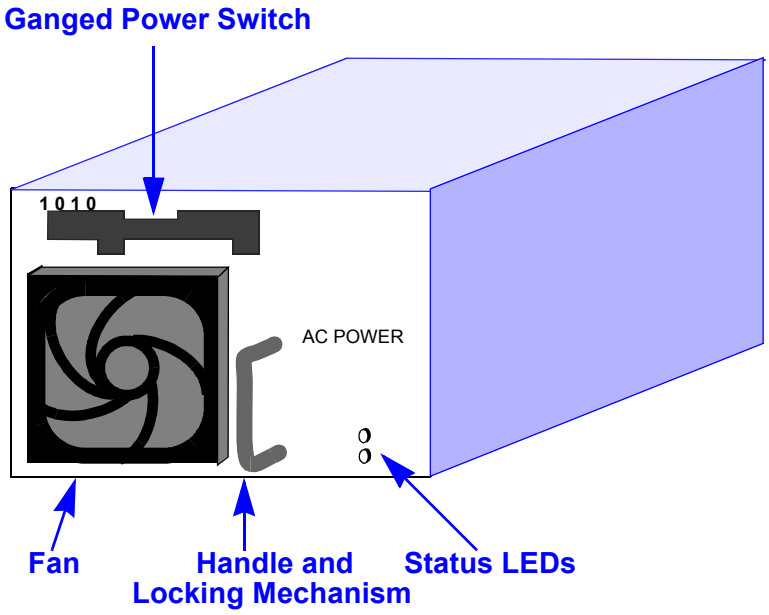


Figure 35. ORCA Power Module

To fully disengage the ORCA gateway from all power, it is necessary to disconnect the power connections from the back of the chassis. This is only required when all current must be removed from the gateway.

Hot-Swap Procedure

Once you have received notification of a power supply failure, either through NueraView, the Nuera Configurator, or by observing the red (Alarm) LED, use the following procedure to remove the faulty supply and insert a new power unit into the system.

Caution

Disconnect power from the faulted power module by moving the ganged dual power switch to its Off (0) position.

Energy hazards exist at the rear of the power bay. Avoid making contact.

1. Ensure that power is disconnected from the faulted power module by moving the ganged dual power switch to its Off (0) position. As a safety precaution, the locking handle is designed to force the module power switch to its Off (0) position.
2. Disengage the spring-loaded locking handle by pushing the top of the handle vertically downward to release the locking mechanism. Rotate the handle outward, releasing the power module from its locked position.
3. Firmly grasp the faulty power module by its disengaged locking handle and remove it half-way by pulling straight outward.

Caution

The power supply is heavy. Make sure to support the bottom of the power supply while pulling the unit out of the chassis.

4. Move locking handle back to its locked (detent) position, and slide the power module out of the ORCA chassis.
5. With its locking handle disengaged, align the replacement power module in its guide slots and slide inward to engage its rear guide pins.
6. Engage locking handle.
7. Apply power to the replacement power module by moving its ganged dual power switch to its On (1) position.
8. Verify that the replacement power module displays a green LED.

Cleaning the Power Supply Fan Filter

ORCA gateway air filters must be cleaned periodically to ensure continued adequate air flow. In a normal environment, the filter should be cleaned at least every six months. In a high-dust environment, it may have to be cleaned as often as once every month. If the air filter is not properly maintained, it may clog the air flow and cause the power supply to overheat and to shut down.

To clean the air filter, refer to Figure 36 and perform the following steps:

Figure 36. Servicing the Power Supply Air Filter

1. Be careful not to dislodge particles into the unit when removing the air filter (described in step 2).
2. Remove the air filter from the unit by snapping the filter housing off the back of the unit and removing the filter from the housing.
3. Wash the air filter in a solution of mild detergent and water.
4. Allow the filter to dry, reinstall it in the housing, and reattach the housing by pressing it back into the rear of the unit.
5. Ensure that the filter-housing locking tabs are engaged.

To service the filter in the 8-slot chassis, refer to Figure 37 and use the following procedure:

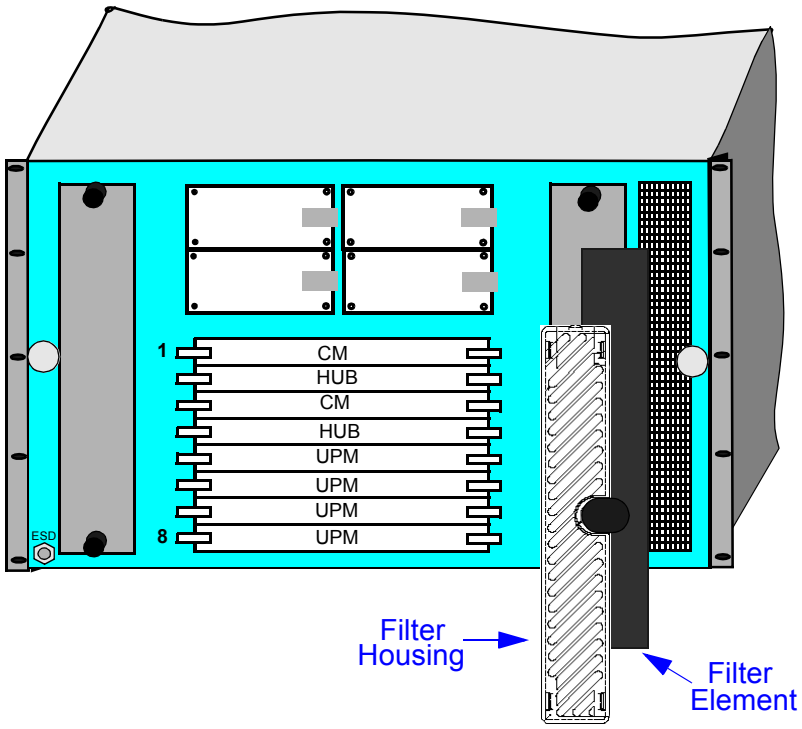


Figure 37. 8-Slot Chassis Filter Maintenance

1. Be careful not to dislodge particles into the unit when removing the air filter (described in step 2).
2. Remove the air filter from the unit by snapping the filter housing off the right front of the unit and removing the filter from the housing.
3. Wash the air filter in a solution of mild detergent and water.
4. Allow the filter to dry, reinstall it in the housing, and reattach the housing by pressing it back into the front of the unit.
5. Ensure that the filter-housing locking tabs are engaged.

8-Slot Chassis Power Modules

A maximum of four, minimum of two power modules are installed at the top of an ORCA 8-slot chassis. In normal operation, the power load is shared equally by all the modules. The 8-slot chassis is designed to run on four power supplies. To have a fully redundant system, all four power supplies must be installed.

Any of the modules can be removed by loosening the screws and first pushing on the black extraction lever, then pulling it straight out to pry the module out of its housing.

Hot-Swap Procedure

Once you have received notification of a power supply failure by observing the red (Alarm) LED, remove the faulty supply and insert a new power unit into the system, following the directions above. It is neither necessary nor recommended that you disconnect power from the rear of the power bay. Verify that the replacement power module displays a green LED.

Fan Module Maintenance

21-Slot Chassis Ventilation

Given the complexity of the internal circuitry of an ORCA gateway, maintaining operating temperatures within acceptable levels is critical. Cooling is provided by two fan modules at the top of the ORCA gateway, which cool the card modules, and by integral fans within the two power supplies. Ensure that air intake and exhaust areas are never obstructed during gateway operation.

Each module can be removed by loosening its four captive thumbscrews and pulling directly outward from the front of the unit. A handle is provided for this purpose.

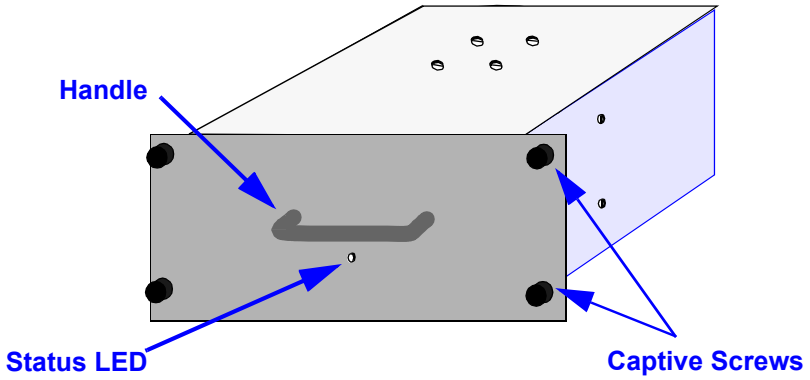


Figure 38. ORCA Fan Module

Hot-Swap Procedure

Once you have received notification of a fan module failure, either through the Nuera Configurator, NueraView, or by observing the red (Alarm) LED, use the following procedure to remove the faulty fan and insert a new fan unit in the system.

Caution

Removing an ORCA gateway fan module alters the airflow characteristics of the ORCA gateway chassis. Operating an ORCA gateway in this condition can cause overheating. To avoid potential damage or loss of service, ensure that fan removal or replacement is performed in less than five minutes.

1. Ensure that the replacement fan module is ready for insertion.
2. Turn the four captive thumbscrews on the failed module counter-clockwise to disengage locking tabs.
3. Remove the failed fan module by grasping its handle and pulling straight outward.
4. Align replacement fan module in its guide slot and gently slide it inward to engage its rear guide pins.
5. Fasten module locking tabs by turning all four captive

thumbscrews clockwise until they are finger tight.

8-Slot Chassis Ventilation

Given the complexity of the internal circuitry of an ORCA BTX, maintaining operating temperatures within acceptable levels is critical. Cooling is provided by two fan trays at either side of the ORCA BTX, which cool the card modules.

Fan Tray

Each tray can be removed by loosening the captive screws on the front of the unit and pulling the tray straight out from the chassis as shown in Figure 39.

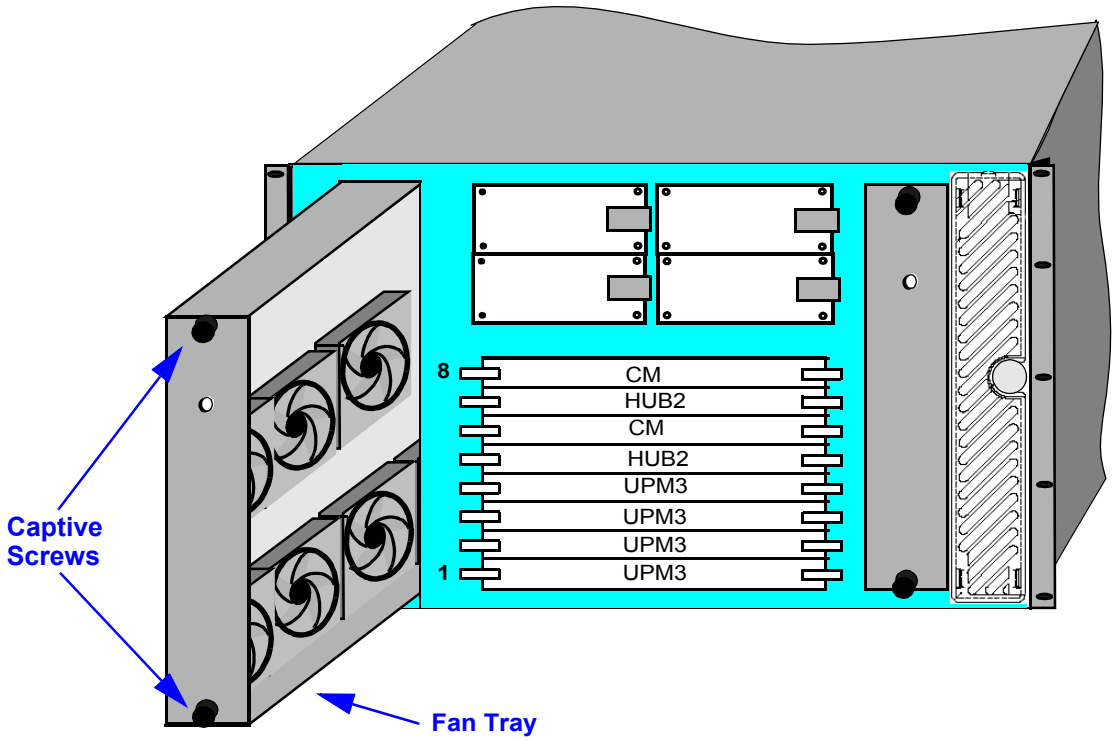


Figure 39. Fan Tray Replacement, 8-Slot Chassis

LED Indicators

ORCA 8-slot chassis fan trays are equipped with a front-panel, bi-color LED status indicator. Normal function displays a green LED indication. A red LED indicates that one or more of the fans in the tray are not rotating. If the LED is not lit, the fan module has lost connection to the -12V power supply rail.

Hot-Swap Procedure

Once you have received notification of a fan tray failure by observing the red (Alarm) LED, remove the faulty fan tray and insert a new fan tray in the system, following the directions above.

Note

Individual fan components of the fan tray cannot be fixed or replaced by the user. If any component of the fan tray fails, the entire tray must be replaced. Faulty fan trays can be sent back to Nuera to be serviced.

Caution

Removing an ORCA 8-slot fan tray alters the airflow characteristics of the ORCA 8-slot chassis. Operating an ORCA gateway in this condition can cause overheating. To avoid potential damage or loss of service, ensure that fan removal or replacement is performed in less than five minutes.

Card Maintenance

This section explains how to install, remove, and hot-swap ORCA gateway cards (modules). It also covers how to move configured CM cards between active gateways.

Caution

The HUB2X-1000Base-SX is a Class 1 laser product.

Do not stare directly into the laser beam or view it directly with optical instruments.

Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.

Unterminated optical connectors can emit invisible laser radiation. The lens in the human eye focuses all the laser power on the retina, so even a low power laser could permanently damage the eye if it is focused directly on the laser source.

Installing Cards

ORCA gateway cards are designed to fit snugly within the chassis. This ensures that, once installed, card modules remain in place and provide reliable service in the most demanding environments.

When placing a card into the chassis, use the following procedures.

Note

When installing new cards, it is recommended that the cards be installed into the card slots in an incremental fashion, rather than randomly staggering the cards throughout the chassis.

Front Card Installation

1. Ensure the black ejector tabs at the front of the replacement card are in the unlocked position as shown in Figure 40.

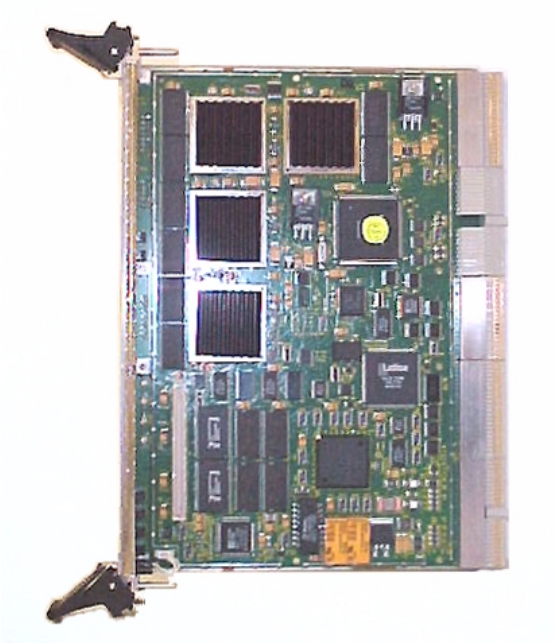


Figure 40. Ejector Tabs in Unlocked Position

2. Place the bottom edge of the card into the bottom card guide slot. Notice the metal ESD clip shown in Figure 42 on page 128 located approximately.5" (12mm) from the opening of the channel. The edge of the card must be inserted into the channel outbound of this clip.
3. Place the top edge of the card into the corresponding top card guide slot as shown in Figure 41 on page 127.

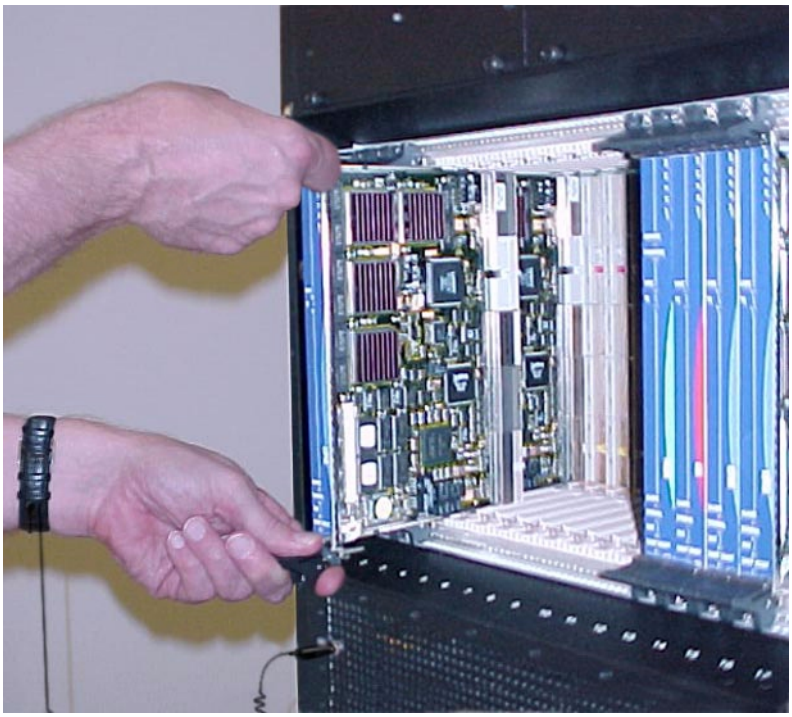


Figure 41. Aligning Card in Guide Slot

4. Gently push and pull the card in an up-and-down rocking motion. (Do NOT move the card from side to side. This action may damage the card.) The leading edge of the card must slide in its guide slots past the ESD clip located in the bottom guide slot and into the chassis toward the midplane. See Figure 42 on page 128.

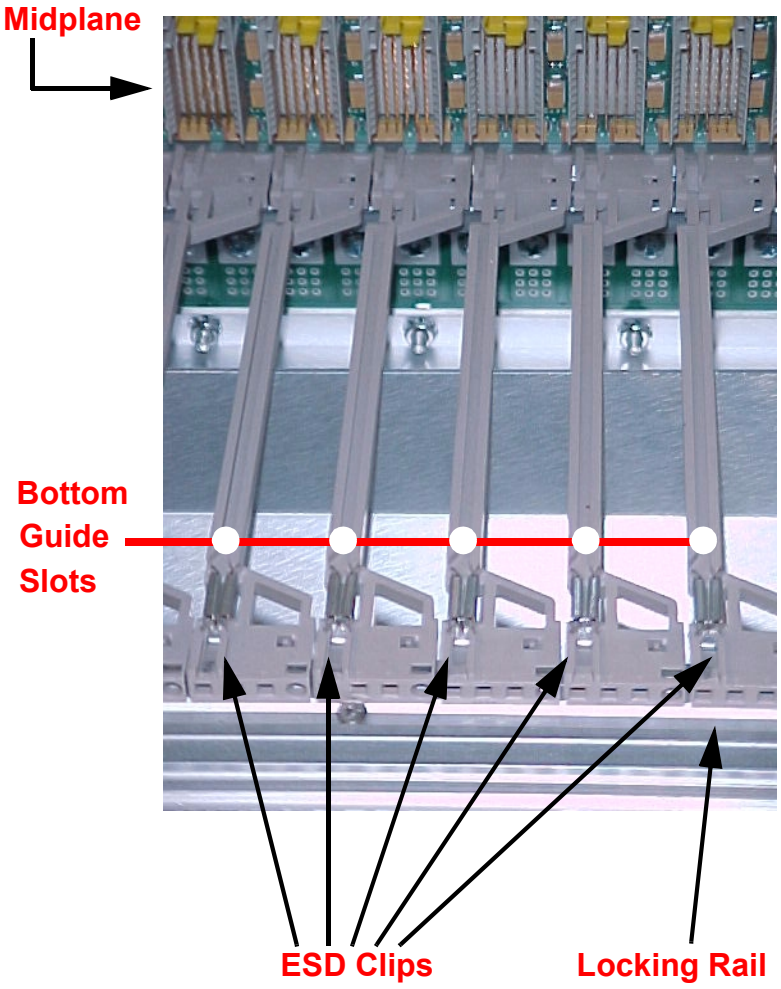


Figure 42. Card Slots (Showing ESD Clips)

Ensure that the guide pins on the card's trailing edge are properly aligned as shown in Figure 43 on page 129.

5. Slowly push the card into its corresponding midplane connectors until the black ejector tabs at the trailing edge of the card (top and bottom) make contact with the upper and lower aluminum locking rails as shown in Figure 43 on page 129.

Figure 43. Aligning Guide Pins

6. Push the ejector tabs to the locked position to secure them into the locking rail as shown in Figure 44 on page 130. This action fully engages the card's contacts into the midplane connectors.

Figure 44. Ejector Tabs in Locked Position

7. Fasten the module's top and bottom captive anchor screws firmly using a small screwdriver. Screw locations are shown in Figure 44. Do not overtighten.

Rear Card Installation

Use the same procedure presented in "Front Card Installation" on page 126; however, be aware that the top and bottom guide slots for rear-mounted cards do not have ESD clips. Be sure to reconnect rear card cabling after module replacement.

Removing Cards

Caution

When removing ORCA gateway card modules, ensure that the module's top and bottom captive anchor screws are completely loose. Do not use force when installing or removing ORCA cards. The precise tolerances require that you use finesse rather than excessive force!

To remove either a front or rear card from an ORCA gateway chassis, use the following procedure and observe the following precautions:

- If the card to be removed is a rear card, you must disconnect its cabling prior to removal.
- Ensure that the module's top and bottom captive anchor screws are completely loose.
- Set the ejector tabs to the open position.

1. Use a small screwdriver to loosen the upper and lower captive anchor screws located behind the upper and lower ejection tabs of the card to be replaced. Screw location is shown in Figure 45 on page 132.

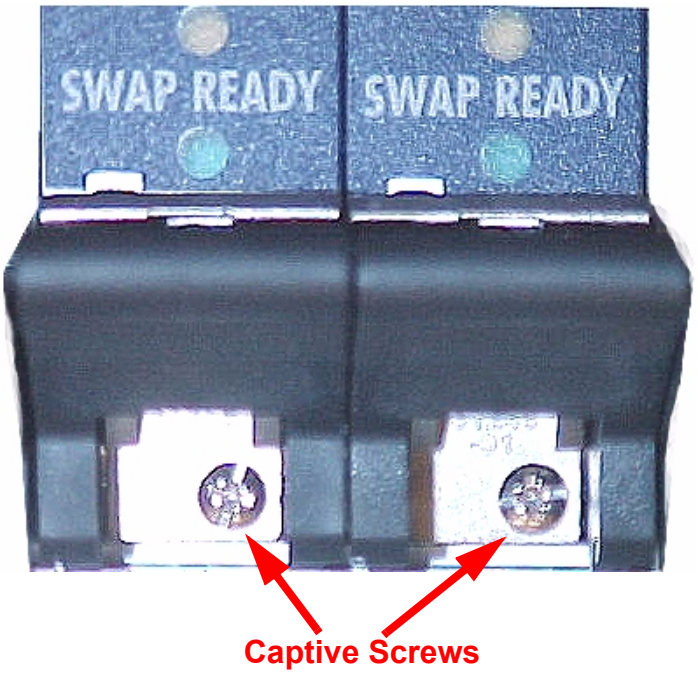


Figure 45. Locating Upper and Lower Captive Screws (Lower Shown)

2. Eject the card to be replaced by pushing both ejector tabs vertically outward until the card disengages from the midplane.
3. Because the side-by-side positioning of the cards in the chassis prevents you from grasping the card by its back-plane, you must pull the card out using its ejector tabs. See Figure 46 on page 133.

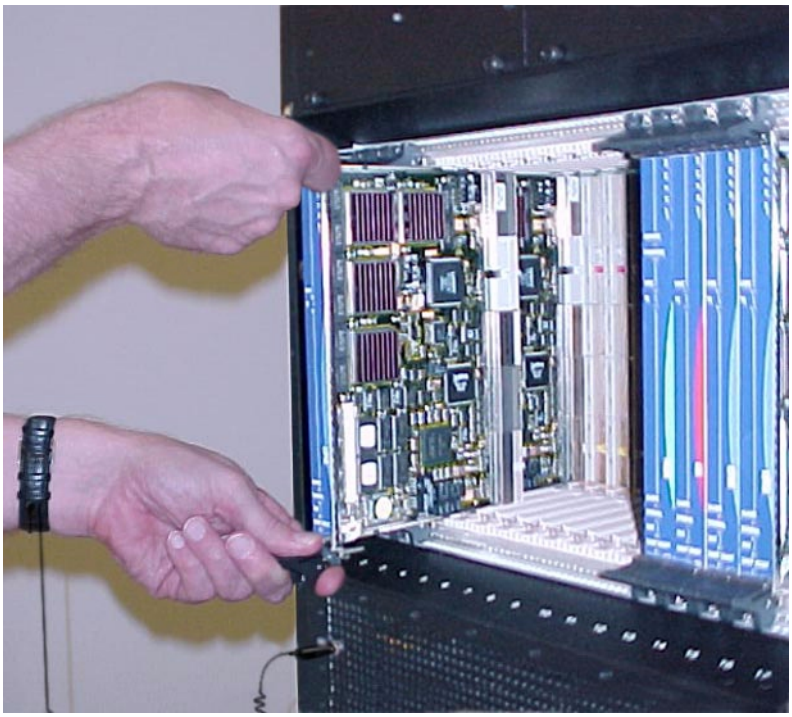


Figure 46. Removing Card

Caution

Do NOT rock the card in the card channel. Use equal force on the top and bottom ejector tabs and pull the card straight out of the chassis.

Swapping CM Cards Between Gateways

Whenever you move a Control Module (CM) card from one ORCA gateway chassis within your application to another ORCA gateway chassis, the new chassis will have a different shelf ID. This causes a shelf ID mismatch to occur. This section provides information about what you must do to resolve this situation.

Standby Mode

If a CM card with a shelf ID mismatch arbitrates to standby mode in a new chassis, its configuration is automatically ini-

tialized (storage initialization), its flash memory is updated with the current shelf ID, and it registers with the active CM card in the new chassis. Therefore in this instance, you do not need to make any modifications.

Active Mode

If a CM card with a shelf ID mismatch arbitrates to active mode in a new chassis, it will not perform the following tasks:

- Activate the ethernet connection
- Register UPM3/UPM4 modules or the standby CM module
- Communicate with the network management system

LED Alarm Indication

In this situation, the console port runs, and the LEDs flash a pattern to indicate this non-functional mode. The LEDs alternate between the two following flash patterns:

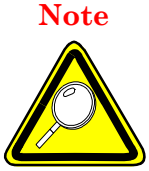
- Red On, Green Off, Yellow On
- Red Off, Green On, Yellow Off

Clearing the Alarm

To clear this alarm mode:

1. Connect a PC to the console port located on the ORCA CMX module.
2. Launch a terminal communications program.
3. From the console prompt, enter a valid decimal IP address for the card:

   `ETHERNET IP` ***`nnn.nnn.nnn.nnn`***



You can reassign the current IP address or use a new one.

4. You will be prompted to proceed. Answer **yes** to continue, or **no** to cancel. Be aware that continuing will erase any configuration information currently held in the CM module.
5. Wait until prompted, then turn off power to the ORCA gateway, and turn it back on.

   The IP addresses of the UPM3/UPM4s and Standby CM are cleared and automatically reassigned based on their slot location. For example, the IP address of the UPM3/UPM4 in slot 3 is assigned as *Active CM IP address* +1; the UPM3/UPM4 in Slot 4 is assigned as *Active CM IP address* +2. The Standby CM IP address is assigned as *Active CM IP address* +12.

   When the IP address is updated and a shelf ID mismatch exists, the configuration is automatically initialized, and the flash memory is updated with the current shelf ID.

   If two CM cards reside in the new chassis when the gateway is turned on, and one possesses the current shelf ID and the other does not, the one with the current shelf ID arbitrates to active mode, and the other arbitrates to standby mode.

   For more information about alarms, see the software manual provided with the gateway.

Hot-Swapping Cards

An ORCA gateway module can be hot-swapped when its blue LED is lit. Failed boards indicate “blue” by an automatic, software-controlled process that systematically removes them from service. ORCA gateway modules can also be forced “blue” by invoking an NMS-controlled command called Virtual Eject. ORCA gateway modules can also be forced “blue” by disengaging the lower ejection tab on the module.

Note

Forcing a module “blue” using the ejection tabs will affect service.

Once you have received notification of a board failure, either through the NMS or by observing the blue LED, use the following procedure to remove the faulty card and insert a new card into the system. See "Removing Cards" on page 131 for more information.

Caution

This procedure involves handling electrostatic sensitive devices. Special care must be taken to avoid damage. Observe the following precautions:

- *Use a grounded wrist strap when handling the module*
- *Avoid touching circuitry or conductive components.*
- *Place the module on an anti-static mat once it is removed from the chassis.*
- *Use an approved anti-static bag and shipping container*

1. Connect a grounding wrist strap attached to your wrist to the ESD connector located on the back right position of the ORCA gateway chassis.
2. Loosen the set screw for the module to be removed
3. Flip the lower ejector tab on the failed module, or issue the Virtual Eject command from the NMS. Ensure that the module to be replaced shows a blue LED indication.
4. For rear cards, use a small screw driver to loosen all cable anchor screws from existing connectors and disconnect all cables from the module, if any.
5. Disengage both ejection tabs from the module to be replaced.
6. Slide the module straight outward, and place in an anti-static container or on a grounded work surface.
7. Remove the replacement module from its anti-static container.
8. Carefully align the replacement module into its guide slots in the ORCA gateway chassis, and insert it gently to engage the rear guide pins.

9. Move both ejector tabs to their locked position and tighten the set screws.
10. Reconnect all cables to their proper connectors.
11. Fasten all cable anchor screws.
12. Remove wrist strap.

If a slot configuration exists for the slot containing the replacement module, the module is programmed automatically. Its LEDs transition in sequence from blue, yellow (Power On Self Test), red (if no configuration exists), to green (online).

After replacement, if no configuration exists for the slot, the module indicates red (present, but not configured). Use the gateway NMS to configure the slot and render the module online.

Upgrading an ORCA Gateway

Upgrading an ORCA gateway generally requires the use of the Nuera Configurator or NueraView. Upgrading procedures that involve these software packages are found in your software manual.

Specific release upgrade procedures may be found in the release notes on the Nuera CD.

Upgrading the Embedded Code

The embedded code is the software that resides on the card modules, the software that runs the ORCA gateway. When this software needs to be updated, the new embedded code must be downloaded from a networked PC through the Nuera Configurator or NueraView. The embedded code is first downloaded to the CM modules, then propagated to the UPM and HST modules from the CM modules. This process

is called “downloading code.” The exact procedure is found in the accompanying software manual.

Nuera handles embedded code upgrades in a number of different ways. Usually updates are available through the Nuera Communications website, while point-release upgrades are on CD only. Contact your Nuera representative upgrade to the latest version of embedded code.

Upgrading Card Modules

To upgrade an ORCA gateway’s card modules, you will need the new card, compatible embedded software, and upgraded Nuera Configurator or NueraView software. Check the software manual for the current hardware and software dependances.

To install the new card, follow the procedures in “Card Maintenance” on page 125 to insert the card into the chassis. The card will not be recognized by the system until the embedded code is upgraded. The procedure for upgrading the embedded code is in the software manual. Then, to configure the card, the configuration software, Nuera Configurator or NueraView, must be updated. This procedure is also in the software manual. Check with your Nuera representative to acquire the correct components and software.

8

TROUBLESHOOTING

This chapter contains information that can help you solve problems that may occur while installing and using your ORCA gateway. For information about ORCA alarms and traps, see the software manual.

System LEDs

This section presents information about ORCA system indicators. The ORCA gateway provides status information through LEDs associated with individual components and also through the Nuera Configurator and NueraView. For information about system status in either set of software, see the software manual.

Card Modules

All ORCA gateway modules (HUB2, HUB2X, CM(3), CMX, UPM3, UPM4, UPMX, HST, HSTX) have LEDs that signal the operational condition of the associated card. These LEDs and their associated conditions are described in the tables below.

Status Indicators

Table 5. LEDs: All Cards

Condition	LED Color	Card/Position	Indicates
Internal Link	Green	HUB2 (Top)	The internal ethernet link between the active HUB2, CM, and UPM3/UPM4 is functioning properly.
External Link	Green	HUB2 (Top)	The external ethernet link from the active HUB2, HUB2X, and external hub or router is functioning properly.
Internal Activity	Green	HUB2 (Top)	Packets are being exchanged over the internal link.
External Activity	Green	HUB2 (Top)	Packets are being exchanged over the external link.
Link	Green	UPM3,UPM4, CM, HST (Top)	The ethernet link to the active HUB2 is functioning properly. (For the HUB2, this signifies that the link out of the HUB2X is transmitting.)
Transmit	Green	UPM3, UPM4, CM, and HST (Top)	The corresponding card is transmitting packets to the ethernet segment.
Sync (1, 2, or 3)	Green	HST (Top)	The port has been configured from the Nuera Configurator and is online, receiving a signal.
Alrm (1, 2, or 3)	Yellow	HST (Top)	Indicates test status. Will light during loopback test.
Line (1, 2, or 3)	Green	HSTX	The HSTX is detecting a receive signal over the DS3 link.
Alarm	Red	All (Bottom)	The corresponding card is in an alarm condition.
Normal	Green	All (Bottom)	The corresponding card is operational and functioning properly.
Test	Yellow	All (Bottom)	The corresponding card is performing a power up Built-In-Test (BIT) or has been instructed to perform a diagnostic test. This LED remains illuminated as long as any test routines are being performed. Exception: standby CM, HST, HSTX, and HUB2 will always show a solid yellow LED.
Swap Ready	Blue	All (Bottom)	The corresponding card is ready to be hot swapped.

Table 5. LEDs: All Cards

Condition	LED Color	Card/Position	Indicates
TFTP Transfer	Red, Green, Yellow	Active CM UPM3, UPM4, HST	When code is being transferred from a PC to the active CM, the LEDs rapidly cycle red, green, yellow on the active CM. When code is being transmitted from the active CM to a UPM3, UPM4, or HST, the LEDs rapidly cycle red, green, yellow on the UPM3 or HST and the CM. When code is being transmitted from the active CM to the standby host, the LEDs on the active CM cycle yellow, green, red, while the LEDs on the standby CM will cycle red, green, yellow. These appear much slower than the other TFTP transfers.
Configuring Standby CM	Red, Green, Yellow	Active CM, Standby CM	While the Active CM is configuring the Standby CM, the LEDs on the Standby CM will rapidly cycle red, green, yellow in the same pattern that is seen during code transfer. The Standby CM, CMX, HUB2, and HUB2X yellow LED lights continuously.
UPM3, HST Removal	Red,Yellow Green, Blue	UPM3, UPM4, HST	If Virtual Eject is used, the red, yellow and green LEDs turn Off. The blue LED then illuminates indicating that the UPM3, UPM4, or HST is ready for removal. If the UPM3, UPM4, or HST is removed immediately, all pending traffic is interrupted.

Error Indicators

Table 6. LEDs: Error Indicators

Condition	LED Color	Card/Position	Indicates
Non-fatal Error	Red	All	The affected card has a non-fatal error condition that can be read via the NMS. The red LED lights continuously.
Software Fatal Error	Blue, Red	All Rear	The affected card has a fatal software error condition that can be read via the NMS. Rear card LEDs indicate continuous blue and flashing red.
FEC-14 Error	All LEDs	All	A Forward Error Correction fault has occurred. All LEDs blink.
Machine Check	Red	All	A Machine Check operation is in progress. The affected module indicates a repeated sequence of 2 red blinks.

Table 6. LEDs: Error Indicators

Condition	LED Color	Card/Position	Indicates
Software Emulation Exception	Red	All	An attempt was made to execute an illegal instruction. The affected module indicates a repeated sequence of 16 red blinks.
TLB Data Miss Exception	Red		The MPC860 processor has detected a TLB Data Miss exception. The affected module indicates a repeated sequence of 18 red blinks.
TLB Data Error Exception	20 Red Blinks		The MPC860 processor has detected a TLB Data Error exception. The affected module indicates a repeated sequence of 20 red blinks.
MPC860 Exception	Red		The affected module has detected an MPC860 exception error. The affected module's red LED blinks continuously. See Chapter 7 of the *MPC860 PowerQUICC User's Manual* for the list of exceptions.
Shelf ID Mismatch	Red, Green, Yellow	CM	A CM has a shelf ID stored in flash memory that is different than the shelf ID of the current chassis. The affected module indicates a repeated alternating sequence of red On, green Off, yellow On, and red Off, green On, yellow Off. The module enters a non functional state.
Illegal MAC Address	Green, Blue	UPM3, UPM4, CM, and HST	The affected module indicates an alternating sequence of green and blue blinking. This pattern indicates an uninitialized or illegal MAC address on a UPM3,UPM4, HST, or CM.

ORCA Power Modules

The ORCA power module provides two front-panel status LEDs that indicate power input and output condition. These LEDs and their associated conditions are described in Table 7.

Table 7. LEDs: Power Modules

Condition	LED Color	Indicates
Normal	Green	The power module output is in regulation
Alarm	Red	A power supply malfunction
Disconnect	None	The power module has lost connection to its main power feed

ORCA Fan Modules

ORCA fan modules are equipped with a front-panel, two-color LED status indicator. These LEDs and their associated conditions are described in Table 8.

Table 8. LEDs: Fan Modules

Condition	LED Color	Indicates
Normal	Green	The power module output is in regulation
Alarm	Red	The fan is not rotating
Disconnect	None	The fan module has lost connection to the -12V power supply rail

System Alarms

If any of the modules fail, an alarm is sent to the Nuera Configurator or NueraView (if the software is connected to the gateway). These alarms are discussed in detail in the software manual.

Getting Help

If, after installing and configuring your Nuera equipment, you cannot establish communications to or from the unit, carefully review the information in this book and in the other ORCA books prior to calling Technical Assistance Center (TAC).

Checklist

Ensure that you have checked the following possibilities:

1. Configuration of the console port. Check that the baud rate of your terminal matches the preset settings of the

Nuera units being installed.

2. Reset the equipment. When cycling power, be sure to leave the power off for a minimum of 30 seconds before reapplying power to the unit.
3. Review the ORCA gateway commands. See “Console Port Commands” on page 100.
4. Check your software version. To ensure that all our customers have the latest enhancements and product features, Nuera ships every new or factory-upgraded unit with the latest software version. Therefore, whenever you are installing or reinstalling units into your system, check each unit to verify that all units are equipped with identical software versions.

Last Resort

If your problem persists after carefully reviewing the information in this book and in the other ORCA books, contact either your product representative or a service representative at Nuera’s Technical Assistance Center. Prior to calling, ensure that you have assembled all the pertinent data that will assist in resolving your problem. These items include:

- A detailed description of your problem
- A complete listing of your system components and configuration. Include your unit’s serial number and the software version number it is running
- A narrative of the actions you performed prior to the problem
- A list of all system messages posted by your unit.

Your Nuera service representative will advise you as to the appropriate course of action.

Contacts

Address:

Nuera Communications

10445 Pacific Center Court
San Diego, CA 92121 USA

Telephone:

1-800-966-8372, Extension 1391

1-858-625-2400

Appendix A

SPECIFICATIONS

All gateway specifications are subject to change without notice.

21-slot Chassis Specifications

Voice Channels

Echo Cancellation

Each voice channel in an ORCA gateway system meets or exceeds ITU G.168 recommendations for near-end echoes delayed by up to 54ms. The exceptions to G.168 are throughput delay, phase reversal, and tone disabler. The echo canceller provides approximately 40dB of echo attenuation. The residual echo is further attenuated to imperceptible levels by a non-linear processing function. This is also referred to as NLP, center clipper, or residual echo suppressor. The NLP as well as the echo canceller can be disabled via configuration without interruption of voice processing.

Performance of an echo canceller is also a function of the echo return loss (ERL) provided by the 2-wire/4-wire hybrid. The echo canceller can operate with ERL values as low as 6dB. Typical convergence time of the echo canceller is less than 1 second and occurs at the beginning of the first active speech interval.

Signaling

Currently supports out-of-band signaling.

Voice Levels

Supports Rx and Tx gain adjustments on all voice channels from -16 db to +7 db.

The voice ports on the gateway can use automatic gain control on a port-by-port basis. When enabled, the gain on each port is kept in the optimum range of the vocoder to provide optimal voice quality.

Fax III

Supports Group III FAX protocols V.17, V.21, V.27, and V.29 at baud rates up to 14.4 Kbps. Maximum FAX rate can be configured independently of the voice rate.The maximum rate is selectable by the user. Supports auto fallback, and tolerates network delays of up to 1 second.

Voice Compression

Gateways use silence suppression and low-bit-rate voice (LBRV) compression techniques to achieve compression ratios as high as 20:1. Gateways support the following voice compression algorithms on a per-channel basis:

Vocoder	Rate
PCM/G.711	64Kbps
ECELP	4.8, 7.4, 9.6Kbps
G.723.1	5.3, 6.3Kbps
G.726	32Kbps
G.729/G.729A	8Kbps
GSM EFR	12.2Kbps

Table 9. 21-Slot Chassis Supported Voice Compression Algorithms

DS3 Port Interface

Located on the HSTX-DS3 card. It supported up to 3 DS3 connections per bridge module, which splits the signals for

input into the HSTX-DS3 card. RX and TX cables are separate 75-ohm BNC connectors.

- Line Code: B3ZS only
- Line Rate: 44.736 MB/s
- Termination: 75 Ohm
- Line Type (framing): M13 or C-bit Parity
- Line Length: short (0 to 68 m), and long haul

Console Port Interface

Located on CMX card. A single serial port is provided with a male DB9 connector. Only RS232 electrical levels are supported. The console port is asynchronous only, and supports the following characteristics:

- 9600 bps (ANSI ASCII format)
- Parity: None
- Bits: 8
- Stop bits: 1

Alarm Port Interface

Located on CMX card. A single port is provided with a female DB15 connector. This port supports contact closure generation for external alarm indication and supports contact closure detection from external devices.

There are three levels of alarm generation and three levels of detection (critical, major, and minor). Each level is supported by separate conductors.

Ethernet Port

Located on the HUB2X card. The 100Base-T ethernet port on the HUB2X card is IEEE 803.2 compliant and interfaces to 100Base-T.

Gigabit Ethernet Port

Located on the HUB2X card. The gigabit optical ethernet port on the HUB2X card is based on the Physical Medium Dependent (PMD) sub-layer and baseband medium, type 1000Base-SX (long wavelength laser) of IEEE 802.3z. The interface is designed for 1.25GBit/s data rate. The transceiver is capable of driving lines of 2 to 260 meters using

62.5um multi-mode fiber or 2 to 550 meters using 50um multi-mode fiber. The optical port uses 850nm wavelength and is a Class 1 FDA and IEC laser product.

Caution

Class 1 laser product.

Do not stare directly into the laser beam or view it directly with optical instruments.

Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.

Caution

AC Line Requirements

With a line voltage of 120V~, the line requirements are:

90–125V~, 14A maximum.

With a line voltage of 220V~, the line requirements are:

180-250V~, 6.5A maximum.

(11.5A nominal current @ 110V~, 5.7A nominal current @ 220V~, circuit breaker/fuse minimum rating 15 A. Recommended branch wire 14 AWG minimum.)

Use only single-phase, line-to-neutral AC voltage for power input.

DC Line Requirements

–42 to –60V ⎓, 30A

(24.5A nominal current @ –48V, circuit breaker/fuse minimum rating 30A. Recommended branch wire 10 AWG minimum.)

Input Power Consumption (Maximum)

Base unit (with CM3 and HUB2X-1000Base-SX)*: 578W

Base unit (with CM3 and HUB2X-100Base-T)*: 569W

CM card:	6.5W
CM3 card:	12.1W
CMX card:	10.5W
HUB2 card:	27W
HUB2X-100Base-T card:	9.5W
HUB2X-1000Base-SX card	18.3W
UPM3 card:	20W
UPMX card:	10W
HST card:	14W
HSTX card:	10W

* *Worst-case fully-loaded system and power supply efficiency adds a maximum of 420W lost in supply conversion.*

Power supply efficiency (min): 62%

Caution

Internal Fault Current Protection

AC Power Supply:

Internal circuit breaker, 30A

DC Power Supply:

Internal circuit breaker, 70A

Caution

Environmental

0° to 40° C (32° to 104° F), (operating ambient)

-5° to 50° C (23° to 122° F), (short term)*

-20° to 80° C (-4° to -176° F), (non-operating with uncontrolled humidity)

5–85% relative humidity, non-condensing

5–90% short term*, not to exceed 0.024 kg (0.0529 lb.) water per kg (2.1046 lbs) of dry air

95% relative humidity at 40° C (104° F).

**Short Term refers to a period of not more that 96 consecutive hours and a total of not more than 15 days in a single year. In other words, a total of 360 hours in any given year, but no more than 15 occurrences during that one-year period.*

Size

28" H x 17.5" W x 19.5" D overall.

(71.1 CM H x 44.5 CM W x 49.5 CM D)

Compatible with fixed-shelf rack mounting or NEBS-compliant environmental cabinet.

Weight

150 lbs (68.2 kg)

Altitude

60 m (196.85 ft) below sea level and 4000 m (13,123.20 ft) above sea level.

8-slot Chassis Specifications

Voice Channels

Echo Cancellation

Each voice channel in an ORCA gateway system meets or exceeds ITU G.168 recommendations for near-end echoes delayed by up to 54ms. The exceptions to G.165 are throughput delay, phase reversal, and tone disabler. The echo canceller provides approximately 40dB of echo attenuation. The residual echo is further attenuated to imperceptible levels by a non-linear processing function. This is also referred to as NLP, center clipper, or residual echo suppressor. The NLP as well as the echo canceller can be disabled via configuration without interruption of voice processing.

Performance of an echo canceller is also a function of the echo return loss (ERL) provided by the 2-wire/4-wire hybrid. The echo canceller can operate with ERL values as low as 6dB. Typical convergence time of the echo canceller is less than 1 second and occurs at the beginning of the first active speech interval.

Signaling

GR-303, V5.2, NCS.

Voice Levels

Supports Rx and Tx gain adjustments on all voice channels from -16 db to +7 db.

The voice ports can use automatic gain control on a port-by-port basis. When enabled, the ports input are kept in the optimum range of the vocoder to provide optimal voice quality.

Fax III

Supports Group III FAX protocols V.17, V.21, V.27, and V.29 at baud rates up to 14.4 Kbps. Maximum FAX rate can be configured independently of the voice rate.The maximum rate is selectable by the user. Supports auto fallback, and tolerates network delays of up to 1 second.

Voice Compression

ORCA units use silence suppression and low-bit-rate voice (LBRV) compression techniques to achieve compression ratios as high as 20:1. BTX-Series units support the voice compression algorithms on a per-channel basis shown in Table 10.

Vocoder	Rate
PCM3/G.711	64Kbps
G.726	32Kbps

Table 10. 8-Slot Chassis Supported Voice Compression Algorithms

T-1 Port

For the UPMX card T1 port

Up to four T1 connections per UPMX card are available through a single DB-25 male connector. Each T1 port can support either a DSX-1 or DS-1 physical interface with the following general specifications:

Line Code: AMI, B8ZS

Line Rate (DSX-1): 1.544Mbps ±50 bps

Line Rate (DS-1):	1.544Mbps ±200bps network timed
Termination:	100Ω resistive
Framing:	D4, ESF
Line length: (to 6000 feet)	short (0–655 ft) and long haul
Line buildout:	0, -7.5, -15, -22 dB
Error Detection:	CRC-6
Alarm Indication:	TR-TSY-000191

E-1 Port

For the UPMX card E1 port

Up to four E1 connections per UPMX card are available through a single DB-25 male connector. Each E1 port provides a 2.048Mbps CEPT interface with the following general specifications:

Line Code:	G.703 HDB3
Line Rate:	(CEPT)2.048Mbps ±35 bps
Termination:	75Ω/120Ω resistive
Framing:	ITU-T G.704 and G.732
Line length:	Short haul (0–655 ft)
Line buildout:	0, -7.5, -15, -22 dB
Error Detection:	CRC-4
Alarm Indication:	G.732

Console Port Interface

Located on CMX card. A single serial port is provided with a male DB9 connector. Only RS232 electrical levels are supported. The console port is asynchronous only, and supports the following data rates:

- 9600 bps (ANSI ASCII format)
- Parity: None
- Bits: 8
- Stop bits: 1

Alarm Port Interface

Located on CMX card. A single port is provided with a female DB15 connector. This port supports contact closure generation for external alarm indication and supports contact closure detection from external devices.

There are three levels of alarm generation and three levels of detection (critical, major, and minor). Each level is supported by separate conductors.

Serial Port

Located on the UPMX card. There are two serial ports on this card that are not supported in this release.

Ethernet Port

Located on the HUB2X card. The 100Base-T ethernet port on the HUB2X card is IEEE 803.2 compliant and interfaces to 100Base-T.

Caution

AC Line Requirements

With a line voltage of 120V~, the line requirements are:

90–125V~, 6A maximum.

With a line voltage of 220V~, the line requirements are:

180-250V~, 3A maximum.

(5A nominal current @ 110V〜, 2.5A nominal current @ 220V〜, circuit breaker/fuse minimum rating 15A. Recommended branch wire 14 AWG minimum.)

DC Line Requirements

–42 to –60 V ⎓, 13A maximum.

(10A nominal current @ –48V, circuit breaker/fuse minimum rating 15A. Recommended branch wire 14 AWG minimum.)

Input Power Consumption (Maximum)

Base unit (with UPM3s)*:	305.5W
Base unit (with UPM4s)*:	305.5W
CM card:	6.5W
CMX card:	10.5W
HUB2 card:	27W
HUB2X-100Base-T card:	9.5W
UPM3 card:	20W
UPM4 card:	20W
UPMX card:	10W

* *Worst-case fully-loaded system and power supply efficiency adds a maximum of 177W lost in supply conversion.*

Power supply efficiency (min): 62%

Caution

Internal Fault Current Protection

AC Power Supply:

Internal circuit breaker, 10A

DC Power Supply:

Internal circuit breaker, 15A

Caution

Environmental

ORCA 8-slot chassis is engineered to be compliant with NEBS standards GR-1089-CORE and GR-63-CORE.

Size

10.75" H x 17.5" W x 13.5" D overall.

(37.31 CM3 H x 44.45 CM3 W x 34.29 CM3 D)

Compatible with fixed-shelf rack mounting or NEBS-compliant environmental cabinet.

Weight

45.3 lbs (20.55 kg)

Altitude

60 m (196.85 ft) below sea level and 4000 m (13,123.20 ft) above sea level.

Appendix B

Replacement Parts

ORCA gateway replacement parts, assemblies, and cables can be purchased from your Nuera authorized service provider. The tables in this appendix list the part numbers for field-replaceable items.

For the latest information (including prices) on the parts described in this appendix, consult your Nuera representative or see the most recent edition of the Nuera *Global Pricing List* (299-184).

Replacement Assemblies

Table 11. Replacement Assemblies

Description	Part Number
Control Module (CM)	504-103-12
CM Transition Module (CMX)	504-088
HUB2 Module (HUB2)	504-164
HUB2-1000Base-SX Transition Module (HUB2X-1000Base-SX)	504-163
HUB2-100Base-T Transition Module (HUB2X-100Base-T)	504-163-01
Power Supply Module, 90–240 VAC	245-058
Power Supply Module, -48 VDC	245-059
UPM3 Module (UPM3)	504-233
UPM4 Module (UPM4)	504-300
UPM Transition Module (UPMX) T1	504-100-07
UPM Transition Module (UPMX) E1 75Ω	504-100-08
UPM Transition Module (UPMX) E1 120Ω	504-100-09
HST Module (HST)	504-166
HSTX/DS3 Module (HSTX)	504-187-01
HSTX Bridge Module	504-238
Fan Assembly	504-114
Filler Plate, Single, Wide	404-059
Filler Plate, 2-Wide	404-095
Filler Plate, 3-Wide	404-060
Front Door Assy	404-151

Note

The ORCA 21-slot chassis main chassis assembly is not *a field-replaceable item. Contact Nuera field service personnel for warranty repair instructions.*

Power Cables

Chassis Type	Cable Description	Part Number
21-Slot Chassis	EU USA/Canada	504-159 504-160
8-Slot Chassis	CEE 7/7 “Schuko”, Western Europe BS1362, UK AC3112, Australia NEMA5-15P, US/Canada	249-005 249-006 249-008 249-024

Documentation

Table 12. Documentation

Publications	Part Number
ORCA Gateway Hardware Manual	299-335-1*nn*
ORCA GX-Series Software Manual	299-193-5*nn*
ORCA RDT-8g Software Manual	299-297-5*nn*
ORCA RDT-8v Software Manual	299-298-5*nn*

ORCA Connecting Cables

Table 13. Connecting Cables

Cable Description	Part Number
RJ45 (M)-RJ45 (M) 100Base-T Standard Cable 10 ft. 25 ft.	 504-172-010 504-172-025
Optical 1000Base-SX SC Duplex	292-201
DS3 BNC 75 ohm Cable 6 in. 10 ft. 25 ft. 50 ft. 100 ft.	 504-264-0.5 504-264-010 504-264-025 504-264-050 504-264-100
DB25 (F)-to-RJ45 (M) (4x) 10 ft. 25 ft.	 504-121-010 504-121-025
DB25 (F) Telco Straight-to-Open 10 ft. 25 ft.	 504-124-010 504-124-025
DB25 (F)-to-DB25 (F) 10 ft. 25 ft.	 504-146-010 504-146-025

Table 13. Connecting Cables

DB25 (F) to RJ45 Adaptor	504-087

DS3/HST Redundancy Kit

This upgrade kit contains 2 HST modules, 2 HSTX/DS3 modules, 1 HSTX Bridge module, and 12 6-inch BNC 75-ohm cables.

Table 14. DS3/HST Redundancy Kit Part Number

Kit Description	**Part Number**
DS3/HST Redundancy Kit	504-270

CMX Card Console Port Cables

Table 15. CMX Card Console Port Cables

Cable Description	**Part Number**
DB9(F) DTE to DB25(F) DTE, RS232 10 ft. 25 ft.	 500-074-010 500-074-025
DB9(F) DTE to DB25(M) DTE, RS232 10 ft. 25 ft.	 500-075-010 500-075-025
DB9(F) DTE to DB25(F) DCE, RS232 10 ft. 25 ft.	 500-078-010 500-078-025
DB9(F) DTE to DB25(M) DCE, RS232 10 ft. 25 ft.	 500-079-010 500-079-025
DB9(F) DTE to DB9(F) DTE, RS232 Null Modem 10 ft. 25 ft.	 500-252-010 500-252-025
DB9 (F) DTE to DB25 (M) DCE, RS232 to RS485 5 ft. 10 ft.	 501-350-005 501-350-010

For ORCA connecting cables, descriptions, part numbers, and pinout information, see "Cables and Connectors" on page 165.

Appendix C

CABLES AND CONNECTORS

The cables required to connect the ORCA gateway ports vary depending on the application and the physical configuration of the ORCA gateway. This section lists the cables and connectors of the ORCA gateway base unit. These include:

CMX

- Console port DB9 (M) connectors
- Alarm port DB15 (F) connectors

HUB2X

- Ethernet port 1000Base-SX optical connector *(GX-Series only)*
- Ethernet port 100Base-T RJ45 connector

HSTX

- DS3 BNC 75-ohm Telco connector

UPMX

- Telco port DB25 connector
- Two serial port DB26 connectors (not supported)

Note

Cabling can be purchased from Nuera as an optional product, purchased from another vendor, or fabricated by the customer.

CMX Ports

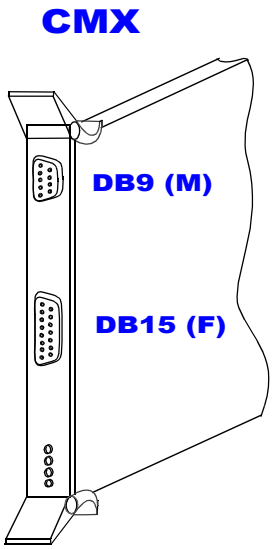


Figure 47. CMX Card Ports

CMX port cables attach to either of the following ORCA ports:

- DB9 (M) console port
- DB15 (F) alarm port

Console Port

Each CMX card provides one DB9 (M) console port connection and a single alarm port connection made through a DB15 (F) connector.

Console Port Connector

The CMX console port connector is a DB9 (M) as shown in Figure 48 on page 167. This port functions as an RS232 DTE interface for console port operation utilizing asynchronous data signals only. No modem control signals are used.

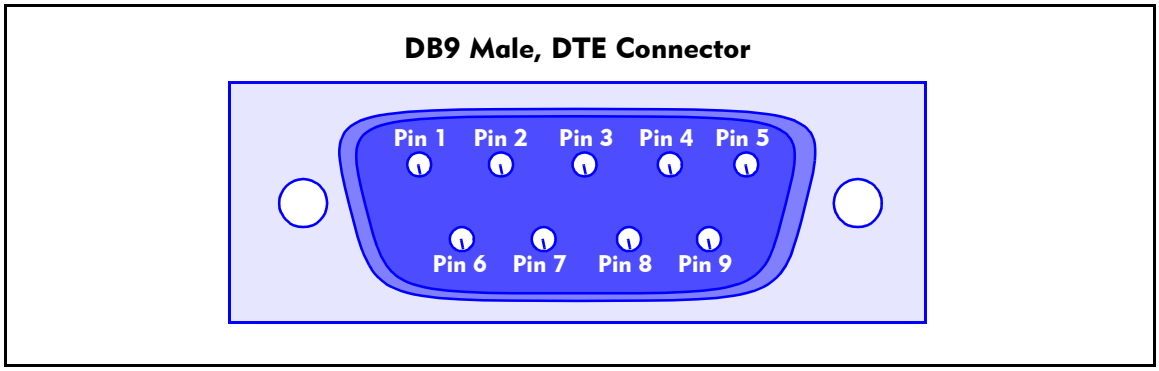


Figure 48. CMX Console Port Connector Pin Assignments

Console Port Pin Assignments

Figure 49 shows the CMX console port DB9 (M) connector pin assignments. When running a PC emulation program such as ProComm Plus with hardware flow control turned off, only pins 2, 3, and 5 are required.

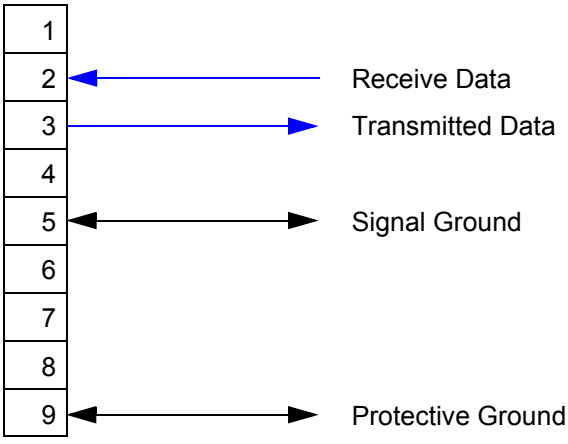


Figure 49. CMX Console Port Connector Pin Assignments

Console Port Cables

This section lists the cables available to attach to this connector in Table 16, and subsequently describes each cable.

Table 16. Console Port Cables

Available Cables	Part Number
DB9 (F) DTE-to-DB25 (F) DTE, RS232	
10 ft.	500-074-010
25 ft.	500-074-025
DB9 (F) DTE-to-DB25 (M) DCE, RS232	
10 ft.	500-075-010
25 ft.	500-075-025
DB9 (F) DTE-to-DB25 (F) DCE, RS232	
10 ft.	500-078-010
25 ft.	500-078-025
DB9 (F) DTE-to-DB25 (M) DCE, RS232	
10 ft.	500-079-010
25 ft.	500-079-025
DB9 (F) DTE-to-DB9 (F) DTE, RS232, Null Modem	
10 ft.	500-252-010
25 ft.	500-252-025
DB9 (F) DTE-to-DB25 (M) DCE, RS232 to RS485	
5 ft.	501-350-005
10 ft.	501-350-010

DB9 (F) DTE-to-DB25 (F or M) DTE, RS232

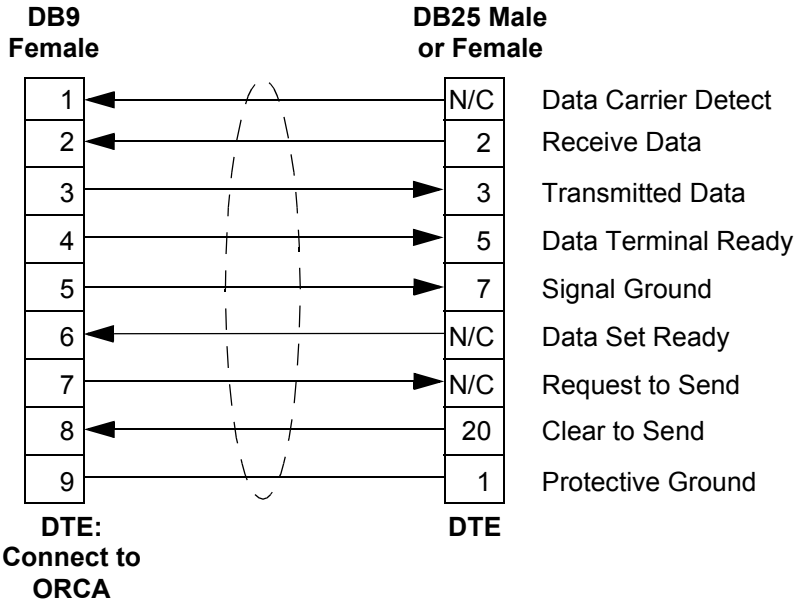


Figure 50. DB9 (F) DTE-to-DB25 (F or M) DTE, RS232 (500-074/075)

DB9 (F) DTE-to-DB25 (F or M) DCE, RS232

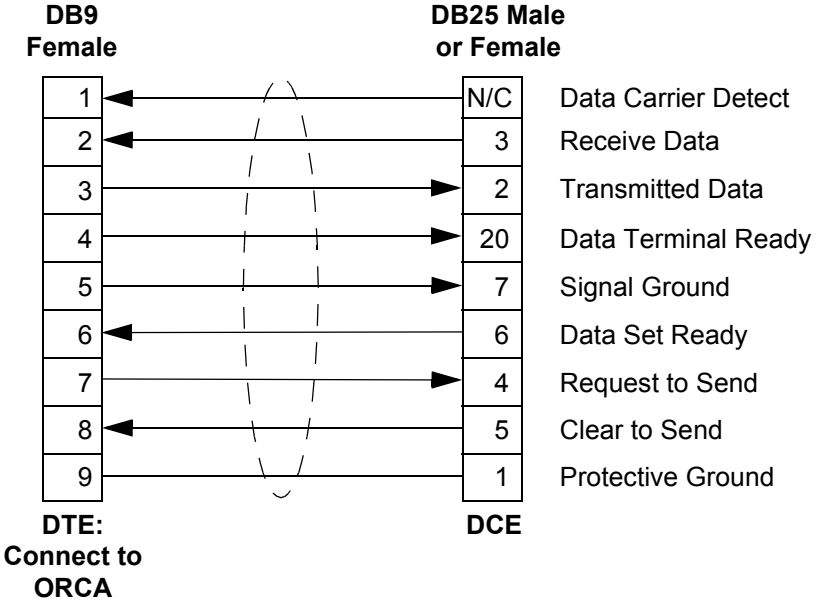


Figure 51. DB9 (F) DTE-to-DB25 (F or M) DCE, RS232 (500-078/079)

DB9 (F) DTE-to-DB9 (F) DTE, RS232, Null Modem

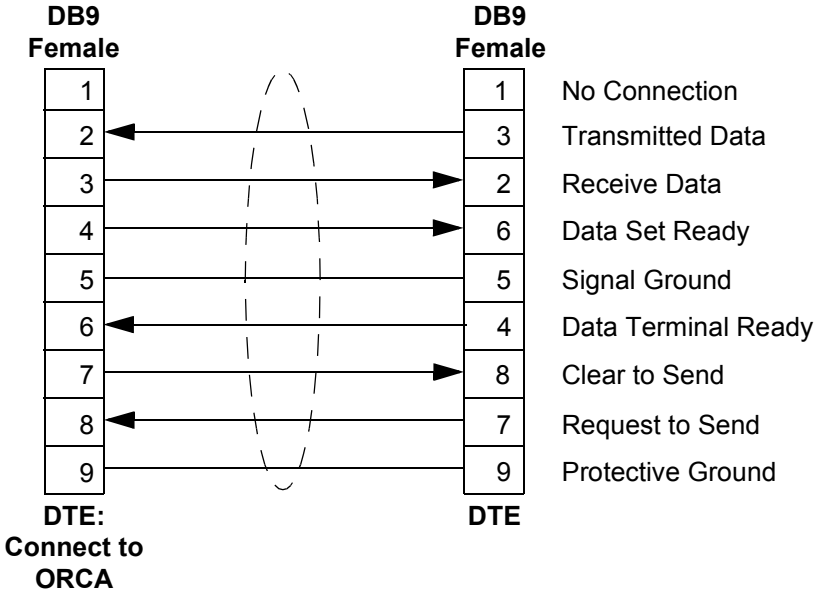


Figure 52. DB9 (F) DTE-to-DB9 (F) DTE, RS232, Null Modem (500-252)

DB9 (F) DTE-to-DB25 (M) DCE, RS232 to RS485

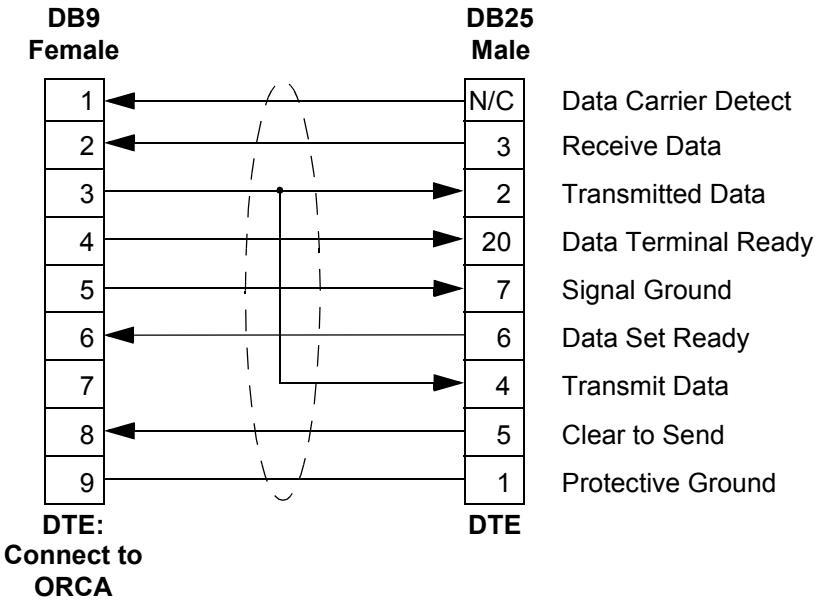


Figure 53. DB9 (F) DTE-to-DB25 (M) DCE, RS232 to RS485 (501-350)

Alarm Port

Alarm Port Connector

The CMX alarm port connector is a DB15 (F) as shown in Figure 54. This enables external alarm indicators to activate upon alarm conditions.

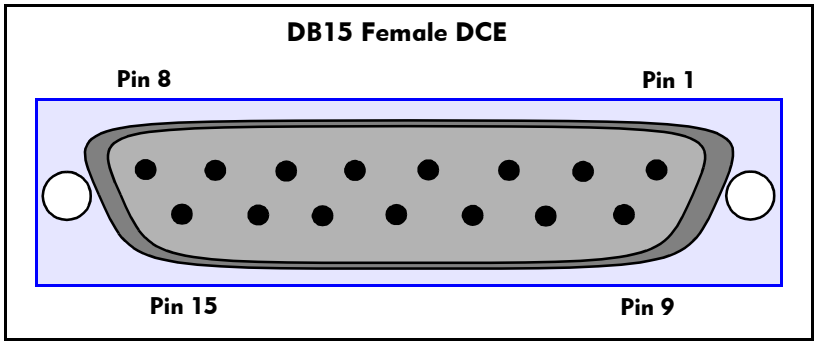


Figure 54. CMX Console Alarm Port Connector

Alarm Port Pin Assignments

Figure 55 shows the CMX alarm port DB15 (F) connector pin assignments.

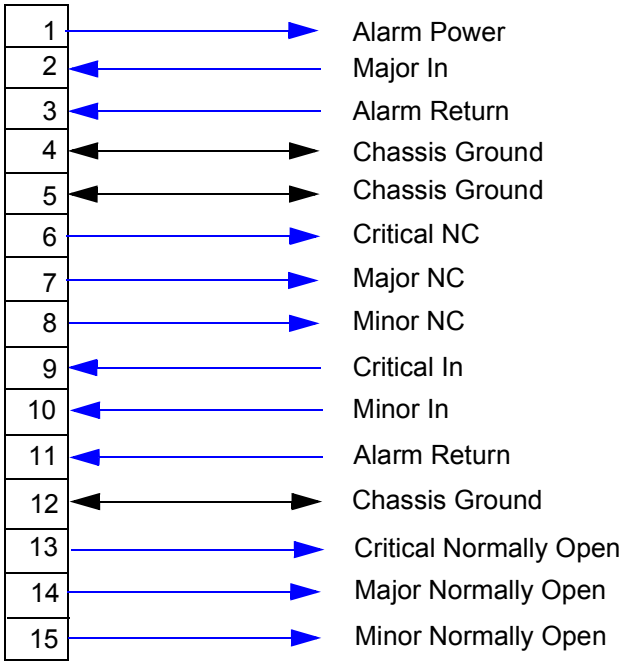


Figure 55. CMX Alarm Port Connector Pin Assignments

Alarm Port Cable

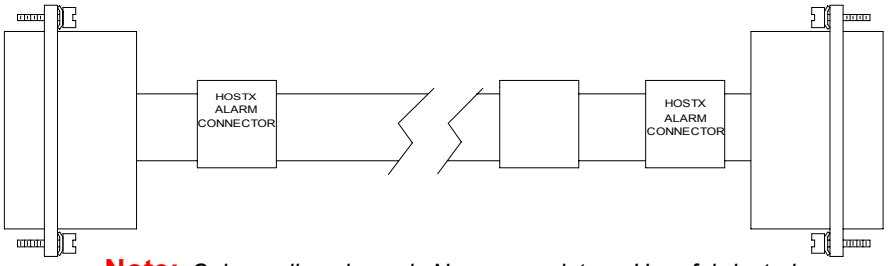
The alarm port DB15 (F) connector is located on the CMX card, which is accessible from the rear of the gateway.

This section lists the cables available to attach to this connector in Table 17, and subsequently describes each cable.

Table 17. Alarm Port Cables

Available Cables	Part Number
DB15 (M)-to-DB15 (M), CMX Alarm Cable	
5 ft.	504-149-005
10 ft.	504-149-010

DB15 (M)-to-DB15 (M), CMX Alarm Cable



Note: *Color coding shown is Nuera proprietary. User-fabricated cables need not match this convention.*

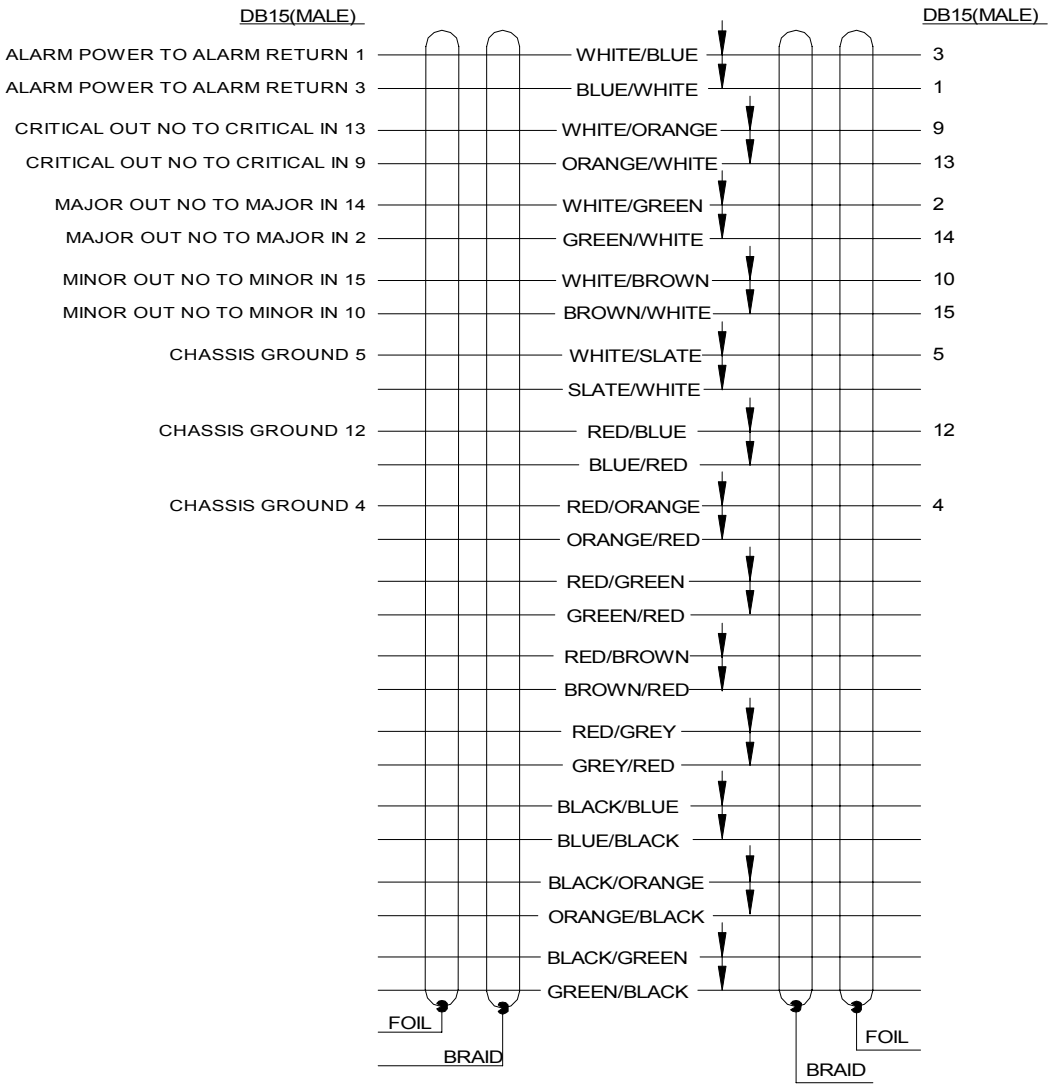


Figure 56. DB15 (M)-to-DB15 (M), CMX Alarm Cable (504-149)

HUB2X Ports

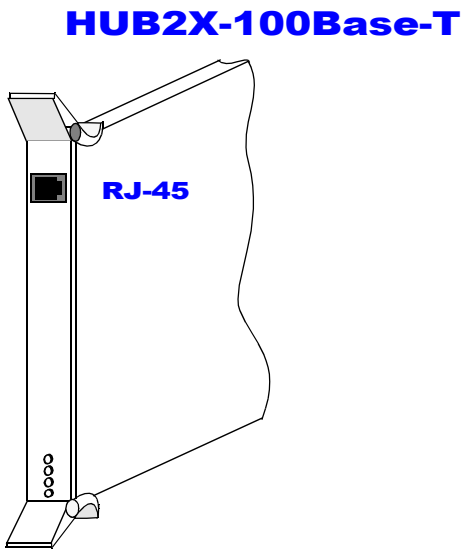


Figure 57. HUB2X-100Base-T Card Ports

The HUB2X-100Base-T card provides an RJ-45 ethernet connection.

RJ-45 Ethernet Port

The RJ-45 ethernet port on the HUB2X-100Base-T card enables external LAN connections to ORCA gateway's internal buses.

RJ-45 Ethernet Connector and Pin Assignments

The HUB2X 100Base-T port connector is an RJ-45 (F). This connector and its pin assignments are shown in Figure 58.

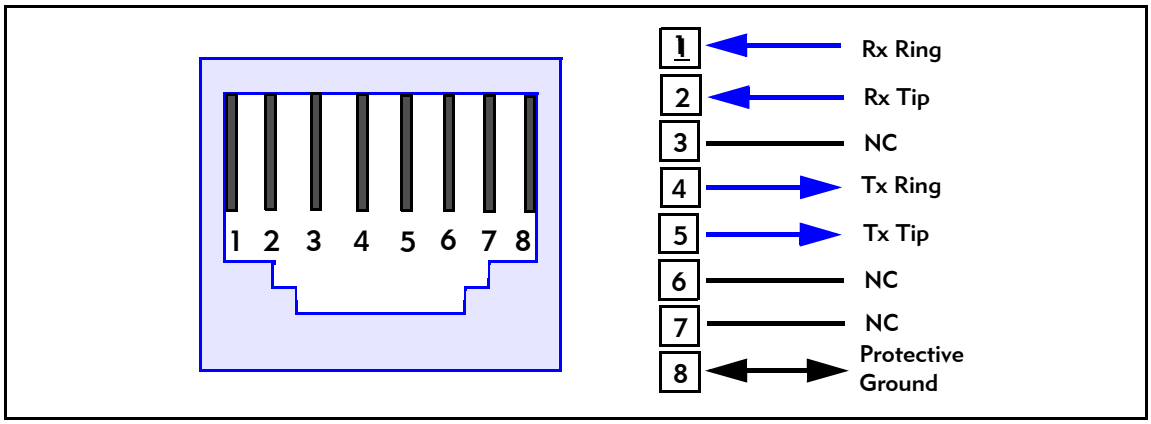


Figure 58. HUB2X-100Base-T Card RJ-45 Connector and Pin Assignments

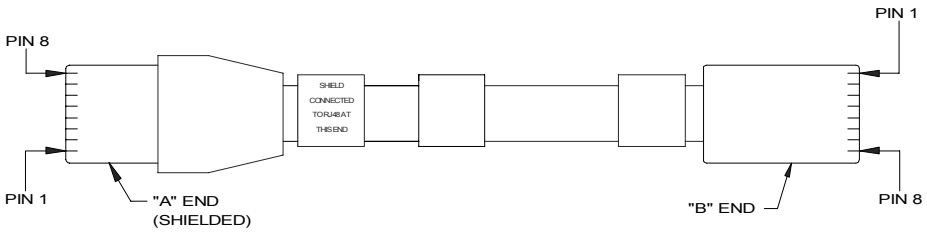
RJ-45 Ethernet Port Cables

This section lists the cables available to attach to this connector in Table 18, and subsequently describes each cable.

Table 18. RJ-45 Ethernet Port Cables

Available Cables	Part Number
100Base-T Standard, Straight RJ-45	
10 ft.	504-172-010
25 ft.	504-172-025

100Base-T Standard, Straight RJ45



WIRE CHART

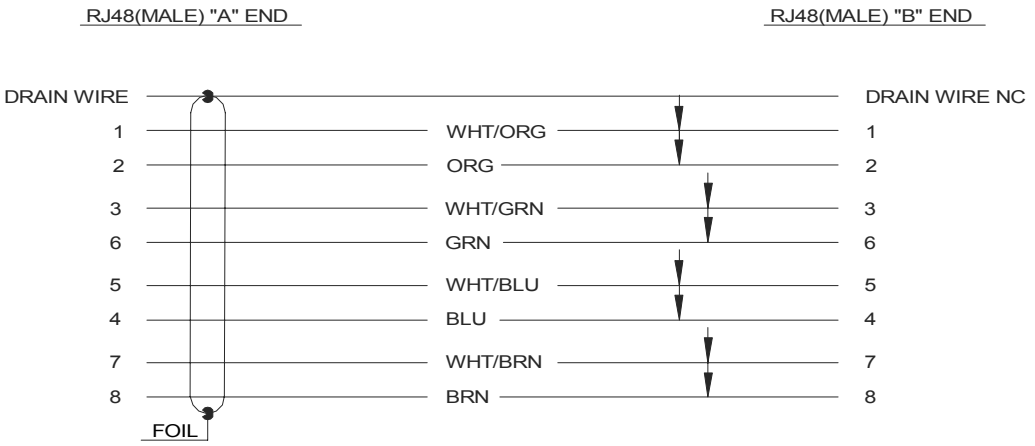


Figure 59. 100Base-T Standard, Straight RJ45 (504-172)

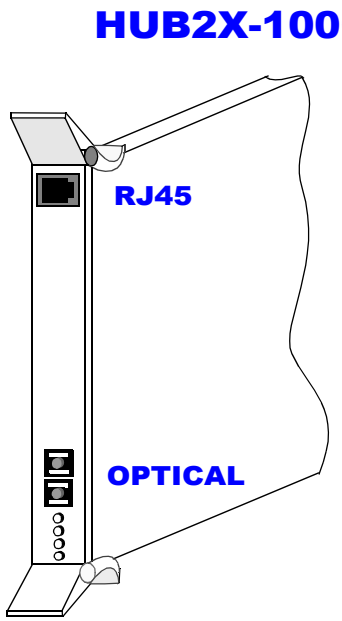


Figure 60. HUB2X1000Base-SX Card Ports

The HUB2X-1000Base-SX card provides:

- an RJ-45 ethernet connection, and
- an optical ethernet connection.

Optical Ethernet Port

The ethernet ports on the HUB2X-1000Base-SX card enable external LAN connections to ORCA gateway's internal buses, with multiple throughput options.

Optical Connector

The HUB2X optical port connector is an SC connector. This connector is shown in Figure 61.

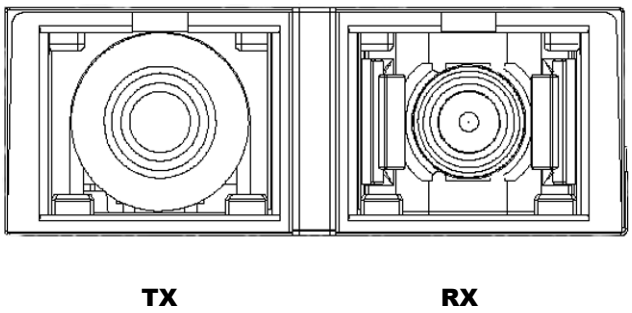


Figure 61. HUB2X Card Optical Connector

The ethernet port RJ-45 connector on the HUB2X-1000Base-SX is identical to the one on the HUB2X-100Base-T card. It is located on the bottom of the card.

HSTX Ports

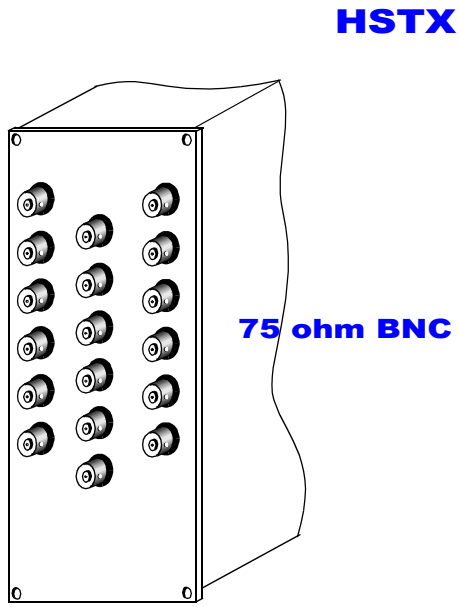


Figure 62. HSTX Card Ports

Each HSTX card provides three Rx DS3 BNC 75-ohm connections and three Tx DS3 BNC 75-ohm connections.

BNC Port

The BNC ports on the HSTX provide the DS3 interface for the ORCA gateway.

BNC Connector

The DS3 BNC connector is shown below.

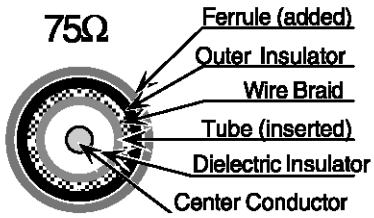


Figure 63. HSTX DS3 BNC Port Connector

BNC Port Cable

This section lists the cables available to attach to this connector in Table 19, and subsequently describes each cable.

Table 19. 75-ohm BNC Port Cables

Available Cables	Part Number
DS3 BNC 75-ohm Cable	
6 in.	504-264-0.5
10 ft.	504-264-010
25 ft.	504-264-025
50 ft.	504-264-050
100 ft.	504-264-100

DS3 BNC 75-ohm Cable

Figure 64. DS3 BNC 75-ohm Cable (504-264)

UPMX Ports

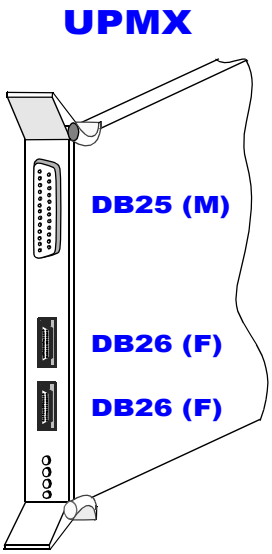


Figure 65. UPMX Card Ports and Connectors

Each UPMX card provides four T1/E1 connections through a DB25 (M) connector.

Telco Port

Telco Port Connector

The physical interface for each is a single DB25 (M) connector over which all spans are available. The connector is shown in Figure 66 on page 182.

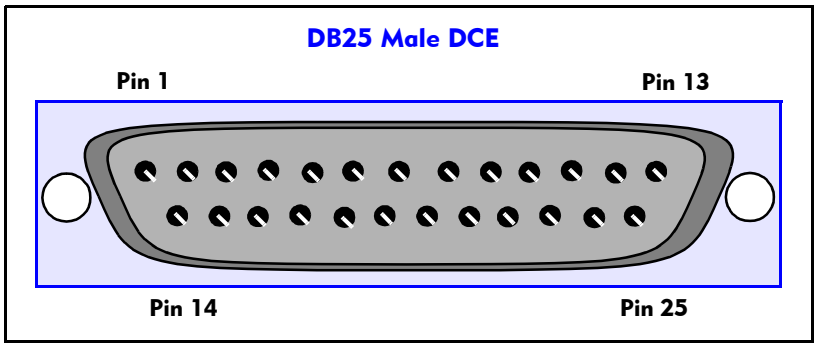


Figure 66. UPMX Card DB25 Connector

These ports provide subscriber-side termination of voice packet streams.

Each T1/E1 port can support either a DSX-1 or a DS-1 physical interface.

Telco Port Pin Assignments

Figure 67 on page 183 shows the telco port DB25 (M) connector pin assignments.

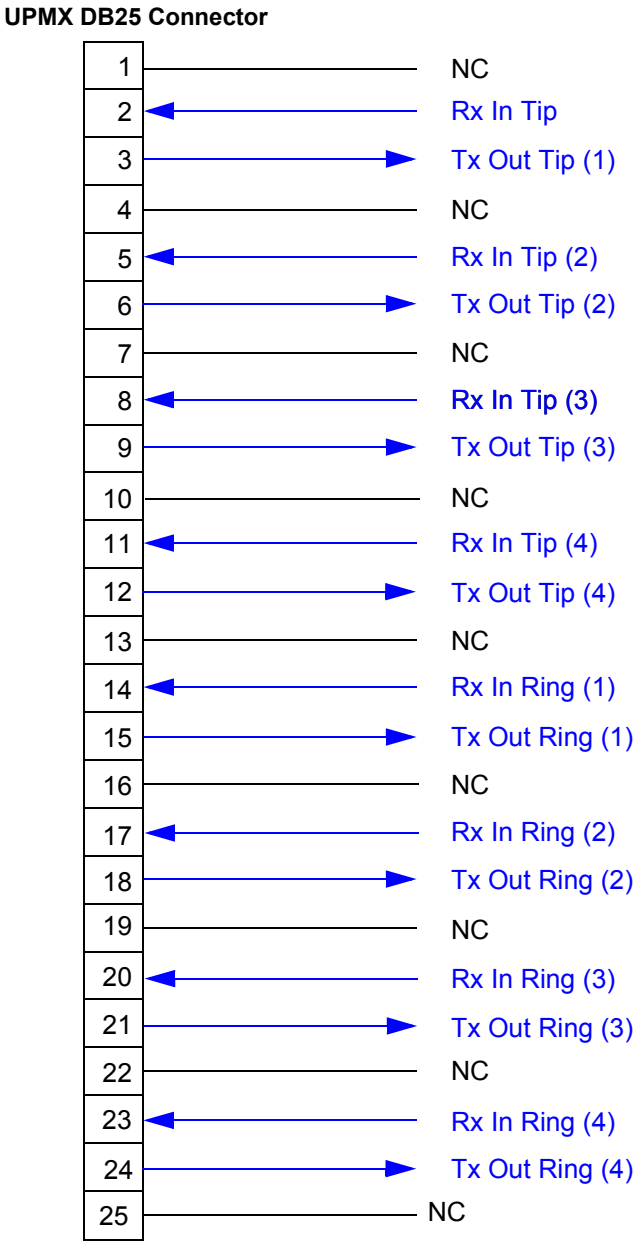


Figure 67. UPMX Card DB25 T1 Interface Pin Assignments

DB25 Port Cables

The T1 port DB25 (M) connector is located on the UPMX T1 card, which is accessible from the rear of the gateway. This

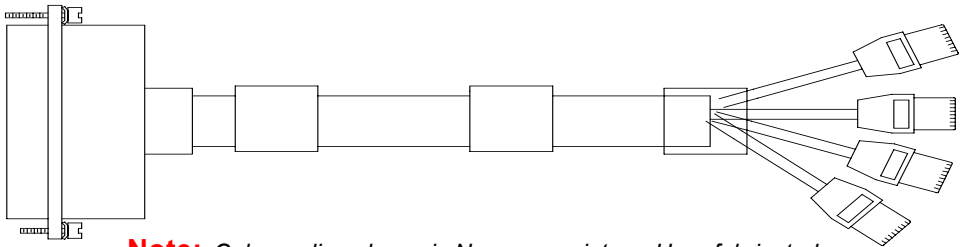
section displays the cables available to attach to this connector.

This section lists the cables available to attach to this connector in Table 20, and subsequently describes each cable.

Table 20. DB25 Port Cables

Available Cables	Part Number
ORCA DB25 (F)-to-RJ45 (M) (4x)	
10 ft.	504-121-010
25 ft.	504-121-025
ORCA DB25 (F) Telco Straight-to-Open	
10 ft.	504-124-010
25 ft.	500-124-025
ORCA DB25 (F)-to-ORCA DB25 (F)	
10 ft.	504-146-010
25 ft.	504-146-025
ORCA DB25 (F)-to-RJ45 Adaptor	504-087

ORCA DB25 (F)-to-RJ45 (M) (4x)



Note: *Color coding shown is Nuera proprietary. User-fabricated cables need not match this convention.*

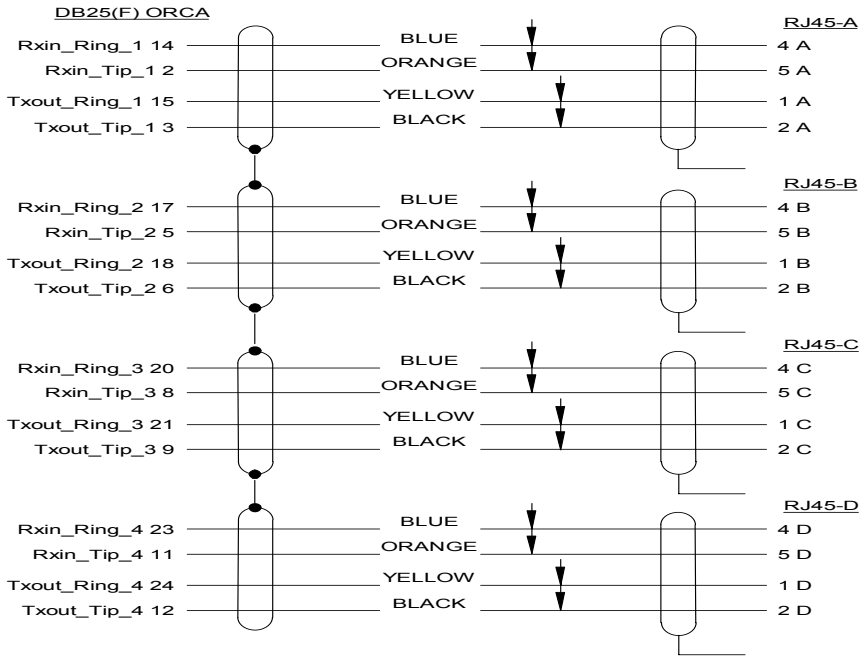
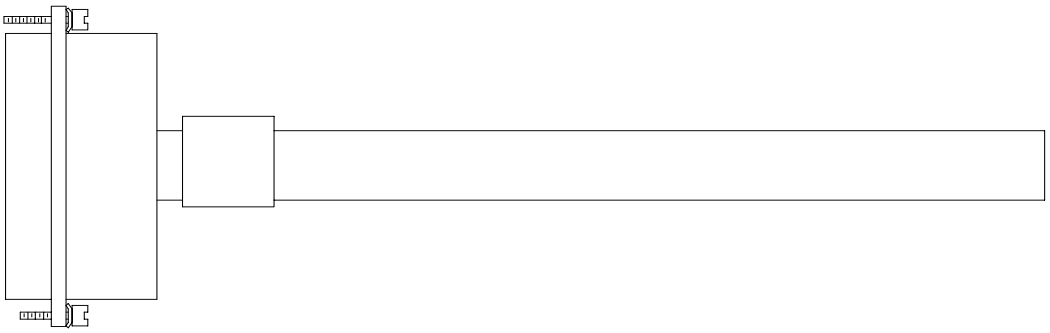


Figure 68. ORCA DB25 (F)-to-RJ45 (M) (4x) (504-121)

ORCA DB25 (F) Telco Straight-to-Open



Note: *Color coding shown is Nuera proprietary. User-fabricated cables need not match this convention.*

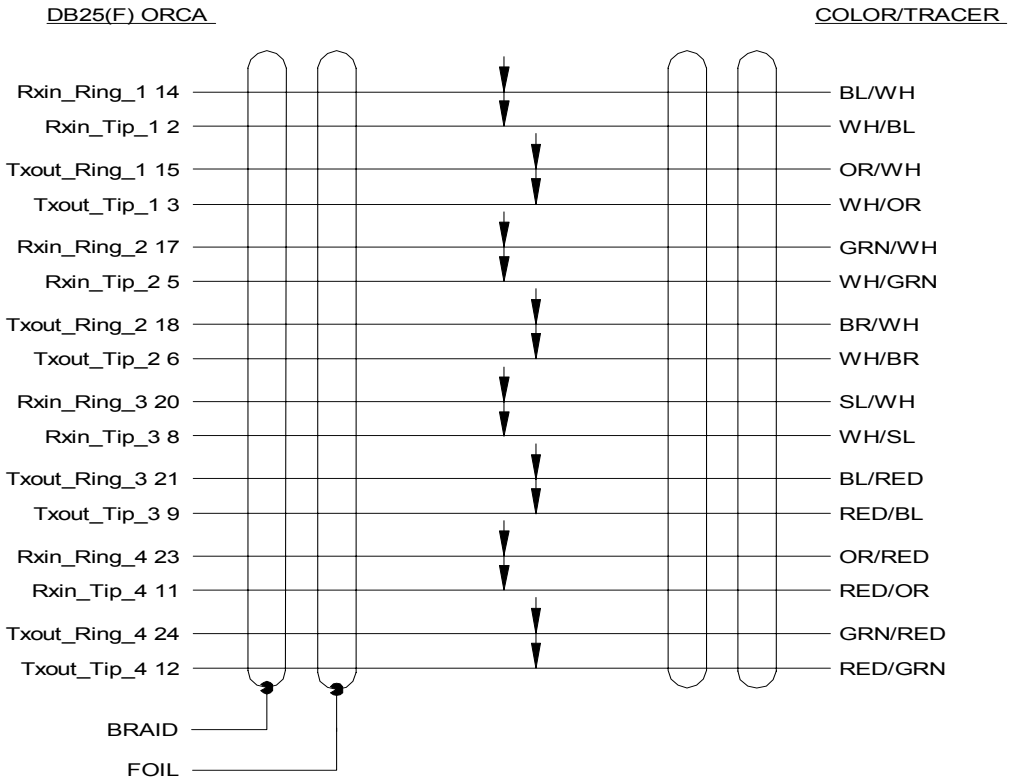
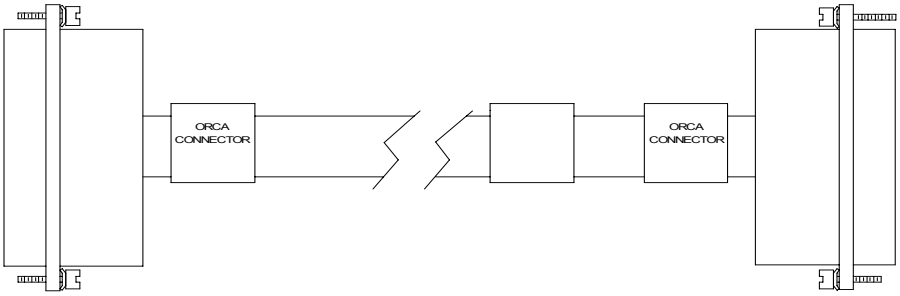


Figure 69. ORCA DB-25 (F) Telco Straight-to-Open (504-124)

ORCA DB25 (F)-to-ORCA DB25 (F)



Note: *Color coding shown is Nuera proprietary. User-fabricated cables need not match this convention.*

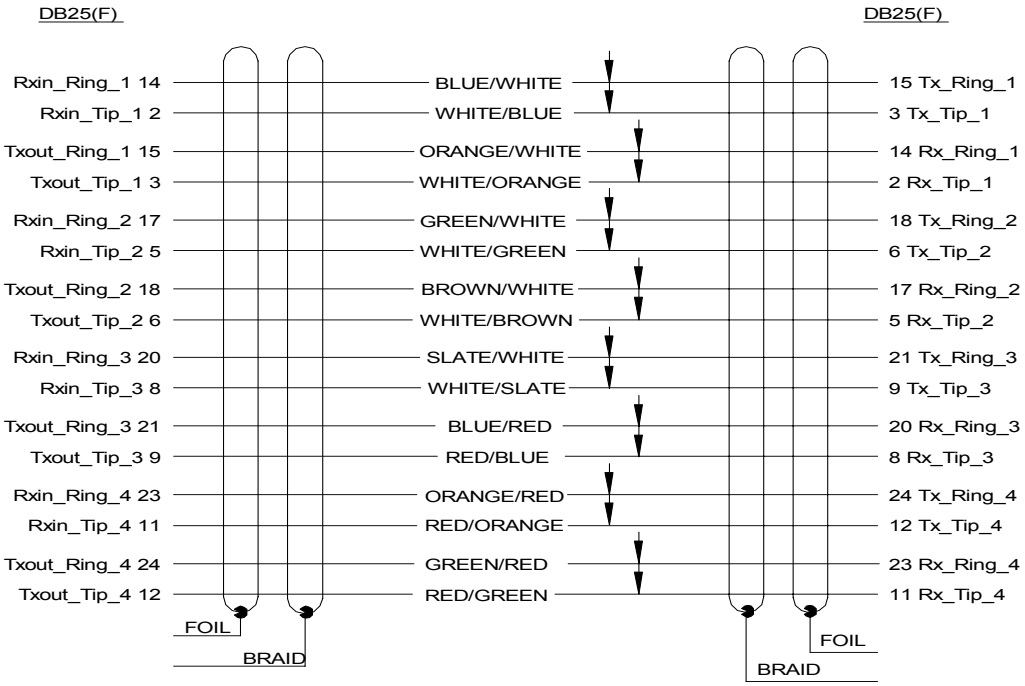


Figure 70. ORCA DB25 (F)-to-ORCA DB25 (F) (504-146)

ORCA DB25 (F) to RJ45 Adaptor

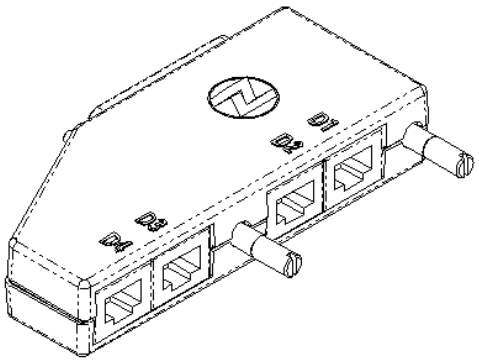


Figure 71. ORCA DB25 (F) to RJ45 Adaptor (504-087)

Appendix D

REGULATORY INFORMATION

This appendix presents pertinent regulatory information for the following countries: United States, Canada, and those in the European Union.

United States FCC Notice

This equipment complies with Part 68 of the FCC rules. On the top panel of this equipment is a label that contains, among other information the FCC registration number for this equipment. You must, upon request, provide this information to your telephone company.

In addition, the telephone company may request the following information:

Type of Interface	T1
Service Order Code(SOC)	6.0F
Facility Interface Code (FIC)	04DU9-BN/DN/1KN/1SN/1ZN

An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring

using a compatible modular jack which is Part 68 compliant. See Installation Instructions for details.

If the terminal equipment UPMX 504-100-01 causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice is not practical, the telephone company will notify you as soon as possible. You will be informed of your right to file a complaint with the FCC.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If you experience trouble with this telephone equipment, please contact Nuera Communications Technical Assistance Center (TAC) in the USA at 10445 Pacific Center Court, San Diego, CA 92121 for information on obtaining service or repair. If the equipment is causing harm to the telephone network, the telephone company may request you to disconnect the equipment until the problem is resolved.

There are no user-serviceable parts in this equipment.

This equipment may not be used on public coin phone service provided by the telephone company. Connection to party line service is subject to state tariffs.

Industry Canada Notice

The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The

department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions might not prevent degradation of service in some situations.

A representative designated by the supplier should coordinate repairs to certified equipment. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

WARRANTY AND REPAIR SERVICE CENTER:

Company Name:_____

Street Address_____

City, State, Zip Code:_____

County:_____

Phone:_____

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the

equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference in which case the user will be required to correct the interference at his own expense.

AFFIDAVIT FOR THE CONNECTION

OF CUSTOMER-PROVIDED COMMUNICATIONS SYSTEMS

NOT SUBJECT TO PART 68 OF THE FCC RULES

For work performed in the certified territory of _____

(Telco's name)

State of _____ County of _____,

I,_____, _____

(Your name) (Business address and phone)

representing _____, a telephone customer located at

(Name of firm)

_____,

(Address and phone)

and being duly sworn, do state as follows:

1. I have responsibility for the operation and maintenance of the customer-provided communications system(s) not subject to Part 68 of the FCC Rules which is (are) to be connected to the telephone network as listed in section (3) below.

2. The said communications system(s) will be connected through FCC registered or grandfathered terminal equipment, systems, or protective circuitry which assures that all of the requirements of FCC Part 68, with the sole exception of signal power level, are met at the telephone interface.

3. The telephone line(s) to which the equipment in (2) above will be connected to, or arranged for connection to, is (are):

_____ _____ _____

_____ _____ _____

_____ _____ _____

4. I attest that all operations associated with the establishment, maintenance and adjustment of the indicated communications system(s) will be made such that the signal power at the telephone network interface within the frequency range of 200 – 4000 Hz continuously complies with Part 68 of the FCC Rules.

5. I attest that the operator(s) maintainer(s) and/or installer(s) of the said communications system(s) responsible for the establishment, maintenance, and adjustment of the voice frequency signal power present at the telephone network interface has more than six months of on-the-job experience in the installation of telephone equipment or is a professional engineer and has read and understands the installation procedures of the equipment.

NOTARY:

_____

Signature

_____

Date

BIBLIOGRAPHY

This appendix provides a brief, annotated bibliography of publications that provide information relevant to the understanding of the design and management of the ORCA communications platform.

Hardware Specifications

"CompactPCI 2.0, R2.1 cPCI Specification", PICMG. Rogers Communications, Wakefield, MA, September, 1997.

CompactPCI is a high-performance industrial computer platform based on the standard PCI electrical specification in rugged Eurocard packaging, with a high-quality 2mm metric pin and socket connector.

CompactPCI is suited for telecommunications, computer telephony, real-time machine control, industrial automation, real-time data acquisition, instrumentation, military systems and other applications requiring high speed computing and modular and robust packaging design. The CompactPCI specification defines both 3U (100 x 160mm) and 6U (233 x 160mm) card formats for modular, rack-based systems.

Version 2.1 incorporates many additions and clarifications over the previous Version 1.0 that was released in November 1995. Enhancements in the CompactPCI 2.1 specification include:

- Clarified/corrected interrupt routing
- IEEE1101.10 enhanced Eurocard mechanics
- Adoption of a consistent method for rear panel I/O connections as defined by the IEEE 1101.11 Draft specification

- Rear panel I/O drawings and pin assignments provided
- Geographic addressing defined that allows a card to read its slot ID
- Physical vs. logical slot addresses defined
- The concept of bus segments vs. backplanes
- Pull-up resistor now required on boards implementing GNT#
- Backplane and board decoupling requirements clarified
- Backplane termination requirements illustrated
- Updated mechanical drawings
- Dedicated clock routing and other provisions for future hot swap
- 32-bit trace lengths for 64-bit and 32-bit systems

Revision 2.1 of the specification provides features useful to telecom, including geographic addressing, standardized rear panel I/O connection methods, and mechanics that address tough international safety and emissions standards.

"CompactPCI 2.1, R1.0 cPCI Hot Swap Specification", PICMG. Rogers Communications, Wakefield, MA, August, 1998.

This document details how to implement the "hot swapping" of components in CompactPCI systems; that is, the capability of removing and replacing components without turning off the system. Hot Swap capability is increasingly important in systems used for applications such as telecommunications, which require that the system be operational at some level continuously. CompactPCI is a high-performance industrial computer platform based on the standard PCI electrical specification in rugged Eurocard packaging, with a high-quality 2mm metric pin and socket connector.

The new CompactPCI Hot Swap Specification defines pin sequencing and other enabling hardware technologies, as well as the software architecture required to support live insertion and extraction of boards in a running CompactPCI system. The new specification was approved in July 1998 by PICMG's Executive membership. Copies are presently being distributed to all members of the organization.

The Hot Swap specification is also available to non-members for a nominal fee

The Hot Swap Specification provides a framework for designing CompactPCI Hot Swap components (boards, backplanes, ICs, platforms, etc.). This framework gives vendors some flexibility to choose the features appropriate for their products, and still operate with all other CompactPCI components (Hot Swap and non-Hot Swap).

"CompactPCI 2.5 R1.0 cPCI Computer Telephony Specification", PICMG. Rogers Communications, Wakefield, MA, April, 1998.

This document defines the utilization of CompactPCI user-definable pins for the computer telephony functions of a standard TDM (Time Division Multiplexed) bus, telephony rear I/O, 48 Volts DC and ringing distribution in a 6U chassis environment. CompactPCI is a high-performance industrial computer platform based on the standard PCI electrical specification in rugged Eurocard packaging, with a high-quality 2mm metric pin and socket connector.

The Computer Telephony Specification extends the capabilities of the CompactPCI architecture to support specific application needs of the industry:

- Hot swappable TDM bus on J4 complying with the ECTF H.110 specification
- Two and four wire I/O of J5 for analog and digital telephony
- Frame grounding techniques based on IEEE 1101.11
- Sub-bus and front panel keying
- Geographical slot addressing and shelf enumeration

This specification provides guidance for backplane/chassis vendors, CT card vendors, and CT system integrators, so as to promote multi-vendor interoperability and the design of open, standards based components and systems.

Network Management Publications

Leinwand, Allan; Conroy, Karen. *Network Management: A Practical Perspective* 2nd Edition. Addison-Wesley Publishing Company, 1996. ISBN 0-201-60999-1

Comer, Douglas. *Internetworking With TCP/IP: Principles, Protocols, and Architecture* 2nd Edition. Englewood Cliffs, New Jersey: Prentice-Hall, 1988. ISBN 0-13-470154-2

Rose, Marshall T. *The Simple Book: An Introduction to Management of TCP/IP-based Internets*. Englewood Cliffs, New Jersey: Prentice-Hall, 1989. ISBN 0-13-812611-9

Murray, James. *Windows NT SNMP* 1st Edition. O'Reilly & Associates Publishing, 1998. ISBN 1-56592-338-3

Hewlett Packard Publications

HP OpenView Network Node Manager Installation Quick Start

This book contains instructions about installing and configuring NNM.

Welcome to Network Node Manager

An overview of NNM, its features, and its capabilities.

Managing Your Network with HP OpenView Network Node Manager

This book contains detailed information to help network administrators configure, maintain, and troubleshoot NNM.

Guide to Scalability and Distribution for Network Node Manager

This advanced book outlines steps you need to take to deploy NNM across multiple management stations within your organization. It contains specific configuration procedures for using the scaling and distribution features of NNM. These features are important when the size of your organization's network exceeds the resources of one NNM management station. They enable you to divide the work load among multiple management stations, yet share the network management information, as needed.

WARRANTY

Nuera's standard warranty is one year from the date of shipment and is verified by serial number of the system. Any defective component will be replaced or repaired at no charge during this period. An advance replacement will be sent or on-site repair performed at Nuera's discretion, at no charge, if any equipment fails within the first 90 days of shipment. After that period, and for the reminder of the warranty, defective modules will be repaired at Nuera and then returned to the customer.

Once the warranty has expired, the components can either be returned to Nuera for repair, or an advance replacement can be provided. The repair and advanced replacement pricing are described in Table 21.

OUT OF WARRANTY REPAIRS

Out of Warranty Repairs are described in Table 21.

Table 21. Out of Warranty Repairs

Part No.	Number of Units	Discount	List Price
800-027-063	ORCA GX / RDT component	F	500

In order to exercise your rights to repair under this warranty, you must first contact Nuera to obtain a repair authorization (RA) number. If you must return the unit to Nuera for repair while the unit is under warranty, Nuera will pay the cost of shipping it to and from Nuera.

SOFTWARE LICENSE AGREEMENT

Any software product, including any documentation relating to or describing such software (hereafter collectively called “Software”), provided by Nuera is furnished to you for installation and use on a single computer. The Software may not be copied, in whole or in part, except for archival purposes, to replace a defective copy, or for program error verification.

You may not reverse engineer, decompile, or disassemble the Software, except to the extent such foregoing restriction is expressly prohibited by applicable law.

Unless earlier terminated by Nuera as herein provided, the term of each paid-up license shall expire at such time as you discontinue use of the applicable Software on the single processor specified above but otherwise shall be without restriction as to time.

The Software (including any images, applets, photographs, animations, video, audio, music, and text incorporated into the Software) is owned by Nuera or its suppliers and is protected by United States copyright laws and international treaty provisions. Therefore, you must treat the Software like any other copyrighted material (for example, a book or musical recording) except that you may either (a) make one copy of the Software solely for backup or archival purposes, or (b) transfer the Software to a single hard disk provided you keep the original solely for backup or archival purposes. You may not copy the printed materials accompanying the Software.

You may not rent or lease the Software, but you may transfer the Software and accompanying written materials on a permanent basis provided you retain no copies and the recipient agrees to the terms of this Agreement. If the Software is an upgrade, any transfer must include the most recent upgrade and all prior versions.

READER'S COMMENT FORM

This book is part of a library that serves as a reference for network communications managers and systems integrators who want to incorporate advanced voice compression technology and data transmission over IP networks for remote access to host sites or to other remote sites. If you have any comments regarding this book (including its content, organization, and format), use this form to communicate them directly to Nuera. You can also send your comments by e-mail to Nuera at tac@nuera.com. If you have received any revision pages to update this book, please identify them in your correspondence.

Your comments will be reviewed and appropriate action taken, as necessary. Nuera may use or distribute the information you supply without incurring any obligation to you.

If you would like additional information regarding the ORCA product series, or any other Nuera product, please contact our marketing department at the following address:

Nuera Communications, Inc.

10445 Pacific Center Court

San Diego, California 92121

U.S.A. 1-(800) 966-8372
U.S.A. 1-(858) 625-2400

Fold along dotted lines and tape. Please do not staple

Place Postage Here

Nuera Communications, Inc.
Information Development
10445 Pacific Center Court
San Diego, CA 92121
USA

Fold along dotted lines and tape. Please do not staple

Nuera Communications, Inc.
10445 Pacific Center Court, San Diego, CA 92121 (858) 625-2400; FAX (858) 625-2422